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EDITOR:
Charles A. Bramble.

SPECIAL CONTRIBUTORS.

NOVA SCOTIA:
Charles Fergie, M.E., Manager Dominion Coal Co., Ltd.
Graham Fraser, Sydney Mines, Cape Breton.
G. H. Duggan, Vice-President Dominion Coal Co., Glace Bay, C.B.

QUEBEC:
J. Obalski, Supt. of Mines, Province of Quebec.
Prof. Frank D. Adams, Professor of Geology, McGill University.
John E. Hardman, M.E., Montreal.

ONTARIO:
A. P. Low, B.Sc., R.G.S., Director, Geological Survey of Canada.
Thos. W. Gibson, Deputy-Minister of Mines, Ontario.
Dr. Alfred E. Barlow, Geological Survey of Canada.
W. G. Miller, Provincial Geologist, Ontario.
H. W. Hixon, Victoria Mines, Sudbury.

BRITISH COLUMBIA:
Alfred W. Dyer, Nelson.

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We have no reasons to advance for the drop of a certain Cobalt stock from over $30.00 to under $11.00. We rather pride ourselves upon such peculiarity; because we think that we are, perhaps, almost singular in this respect. We do not know why the Guggenheims threw up their option on 40,000 shares—thereby depressing the stock some 20 points—because they have not told us. Others claim inside knowledge, but as there are as many versions as there are informants, we feel that a certain amount of caution, respecting each and all these statements, is justified. One thing, we do know, however, which is that Cobalt camp contains a great deal of silver; that about fifty of the mines are shipping; and, that, notwithstanding the horrible fluctuations of the New York curb, and the hysterical excitement of the small investors in Toronto, the miners of Northern Ontario are plugging away, and gradually building up a camp that will assist in spreading Canada's fame to the uttermost parts of the earth.

The stock of some of the best mines is not on the market; while the stock of very many mines, that are not, strictly speaking, mines, is being dealt in gleefully and freely. We are of the opinion the situation was well summed up by a Toronto scribe when he wrote: "Many of the Cobalt mines are lying idle and their owners are lying furiously."

We anticipate that there will be quite a development of the Larder Lake gold field next summer. In fact, it would not be a surprise, if there should be as much interest displayed in Larder Lake a year or two hence as has been the case with Cobalt during the past six months. Moreover, we feel a fatherly interest in Larder Lake, because the Editor of this Review had the honor of naming it, and also of making the first reconnaisance survey of the lake and adjacent waterways.

It happened in this wise: During the summer of 1901, the writer found himself on the White, or Blanche, River, in company with John Wabie, a North Timiskaming Indian, and his son. When we reached the point where Tomstown is now situated,

honest old John, an Indian of great respectability and sterling merit, pointed out that, owing to the unusual lowness of the water, our projected journey to Matachewan would inevitably be a hard one; instead of poling several miles up a small creek, we should have to carry our belongings about 15 miles from theWhite River waters to those of the Montreal River. This was rather more than we had bargained for, and, as there was no particular reason why we should go to Matachewan in preference to any other place, we said to him, "John, where can we go, if I give up my trip to the Montreal River?" We had about three weeks to spare.

"You go to Tegousiewabie," replied John; "find him big lake, lots fish; just like Timagami."

Now, this was just what I wanted, so I took out my map, and, behold, the place where Tegousiewabie was reported to be, was blank! Here was a chance for exploration—fine scenery, good fishing, and goodness knows what beside—all in one trip. So, I gave the word, and the bow of the canoe was turned up the North-East branch of the White River.

"What is the meaning of Tegousiewabie, John?"

"Place where we put our grub," explained he. "When Indian run short grub, he says 'let's go Tegousiewabie, sure find him there." Which, being translated into English, is evidently Larder; because that is the place where families of distinction who have any food, especially game, to preserve, keep it.

After putting in several days on the lake, though, alas, without finding any gold mines, perhaps, because we were not looking for them, being much occupied with latitude, bearings and distances, we returned to civilization by way of the North branch. The Geographic Board accepted courteously our suggestion as to the name of the Lake, after Dr. Robert Bell had satisfied himself that the translation of the Indian name was correct, and our sketch map was also incorporated in later publications issued by the Department of the Interior.

SUGGESTIONS FROM THE GEOLOGICAL SURVEY FOR A COBALT COINAGE.

The discovery of Cobalt ore in large quantities in Northern Ontario and the limited market for that metal, have had a disastrous effect upon its price, which has fallen from three dollars to thirty-seven cents a pound.

At the present time cobalt and its compounds are almost wholly used for pigments, chiefly for coloring glass, or the glaze for pottery, beautiful blue, green, yellow, and bronze colors, suitable for these purposes being obtained from a cobalt base. The metal is said to be very effective for electrical storage batteries, while as a plating material it is much superior to nickel, the coating being harder, brighter and more tenacious. Experiments conducted with a view to the use of cobalt in a manner similar to nickel as an alloy of iron have not proved successful up to the present, notwithstanding that cobalt from its hardness and high magnetic properties would naturally be expected to give superior results.

The market for cobalt colors is a limited one, and in competition with cheaper artificial colors it is not rapidly increasing. The improvements in storage batteries will probably cause an increased demand for the metal while the cheapening of cobalt consequent to the new discoveries may greatly increase its use as a superior plating material.

The present small silver coinage of Canada, especially the five-cent pieces, is inconvenient and is easily lost; in the place of these it is proposed to substitute a larger coin of cobalt approximating in size the nickel five-cent pieces of the United States, while a smaller coin might replace the present bronze cents. Owing to its hardness; maleability and lack of tarnish cobalt is an ideal metal for these coins of low value. It would furnish a unique coinage and would assist greatly in absorbing the surplus of cobalt now being mined. The issue of these coins would secure a considerable profit to the Government, and their introduction would fittingly mark the establishment of the new Canadian mint at Ottawa.

THE GEOLOGICAL SURVEY.

When an up-to-date Geology of Canada comes to be written, one of the principal features of the work will be, we hope, a series of chapters showing the practical good that has resulted from the explorations and examinations of the Geological Survey. There is hardly a mineral industry in Canada that has not directly benefited from the work of the Survey, and this is the more to be appreciated when we remember that the officers of that institution are speaking, as it were, for the Government, and are naturally constrained to be more careful than if they were reporting independently In the former case, the Survey is responsible for what they write, in the latter they alone are responsible.

It is many years since the Survey pointed out the metalliferous character of the Huronian rocks, and the opinions then stated were so soon acknowledged by all mining men and prospectors to be accurate, that any maps published by the department depicting an Huronian area, are always eagerly sought after.

When we review the nickel, copper and gold deposits of the vicinity of Sudbury and Sault Ste. Marie, and especially the silver and cobalt veins of the Timiskaming region, the economic and metalliferous character of the rocks of the Huronian system becomes even more apparent. This fact was recognized and the importance of the geological conditions insisted on by Sir William Logan, in reports of the Survey made nearly fifty

years ago, and it is gratifying to observe that the practical miner has begun to appreciate the value of the large amount of geological work carried out in the districts of Nipissing and Thunder Bay,—work which, a few years ago, might have appeared difficult in the light of any economic results up to that time achieved.

More than ten years ago the late George M. Dawson, then Director of the Geological Survey, made this very definite prophecy—a prophecy that, as we all know, has been so amply fulfilled:—"There can be very little doubt that every square mile of the Huronian formation of Canada will sooner or later become an object of interest to the prospector, and that industries of considerable importance may yet be planted upon this formation far to the north, or for other reasons at present regarded as barren and useless. . . . . Upon Lake Timiskaming is one of the typical Huronian areas."

THE METRIC SYSTEM.

The Metric System is steadily gaining support, and the Dominion Government showed wisdom in issuing a pamphlet descriptive of it. In Great Britain, one of the largest manufacturing firms—Kynoch, of Birmingham—has done away with the complicated English standards, and is adopting in its entirety the French metric system of weights and measures, of which the meter is the unit. In their calculations of costs they are adopting the pound sterling as the unit and are working down to four places of decimals. Tables have been prepared, by which every employee will be able to convert the expressions of English currency into a French or any other unit at a moment's notice.

Lord Kelvin, whose dictum should certainly carry weight, has expressed himself as thoroughly won over by the metric system. In the course of a recent speech, he said: "I believe engineers of every branch will find the metric system exceedingly satisfactory and convenient, when once they begin using it. For measures of length, large or small, the French system is vastly more convenient, in every respect, than our unfortunate British inches, feet, yards, rods, poles, perches (the perch five-and-a-half yards), chains, furlongs and miles. In a mechanical workshop, whether for large machines or small scientific instruments, the smallest named unit, the inch, is much less convenient than the centimeter with its named sub-division, the millimeter.

"The British workman will be much happier at his work with a folding fifty-centimeter rule, graduated to millimeters, than with the folding two foot rule, graduated to eighths, sixteenths or thirty-seconds of an inch. For the smallest division of a workman's scale, the millimeter is particularly easy to read and use, and is thoroughly convenient for the smallest named unit of length.

"I believe if a fifty-centimeter folding rule was presented to each workman in a workshop of 100 or 1,000 highly skilled workmen, the employer would be more than reimbursed in a fortnight by the increase and the improved quality of the produce of his men. Anyone who knows the troublesome character of handwork prescribed in such terms as 1 in. and 3-8 in. and 7-11 in. and 17-32 in. will see that there will be a considerable saving of time when the workman has his job stated to him in so much more easily understood terms, as 59 1-2 mm. Work of the highest accuracy in an engineering workshop is, of course, ultimately controlled by accurately standardised gauges, and for these the designation, whether in inches or centimeters, is of comparatively little importance. But it is of considerable importance to notice that the British engineer leaves thirty-seconds and jumps down to "mils." (thousandths of an inch) in specifying gauges, or in actual work finer than the thirty-second of an inch. Not one of the accurately standardised gauges at present in use in engineering workshops will need to be changed when the metric system is adopted.

"A very large proportion of the work in a drawing office of a civil or mechanical engineer, in this country and in America, is entailed by the monstrously and absurdly inconvenient, and unsystematic sets of measures of length, area, bulk, and weight imposed by bondage to the present British measures. I could give you many examples of the waste of good work under which we now suffer."

It appears to us that most of the arguments against the metric system are extremely weak. They certainly are not more forcible than were those of the old stage-coach man when railways were introduced, and are akin to those of the late Mr. Greener, who in 1858, wrote an elaborate work mainly to prove that the breech-loading system as applied to firearms, could not successfully compete with the time-honored muzzle loader.

We feel that mining men, especially, will find a great benefit through the universal introduction of the metric system. A great deal of the best technical literature comes from the pens of foreign engineers, and all measurements are given according to the metric system; at present, these are not readily translated into their English equivalents by the average mining man.

THE CANADIAN ARCTIC.

A more fascinating subject than Arctic exploration does not exist. There is a fascination about the silent, icy wastes of the North, which once felt is never forgotten; even the stay-at-home traveller, the man who does his explorations in fancy, in a comfortable arm-chair, becomes absorbed by the snowdrifts, and ice fighting, and long, dark months, the sledge travelling, and all the other novel features that go to make up such stories of adventure. We

have seen the sun at midnight and the moon at midday, and have a fair acquaintance with most things that have been written upon Arctic exploration, but, we think, especially for Canadians, one of the most interesting, if not the most interesting account ever published, is the report of the Dominion Government expedition to Hudson's Bay in the Arctic Islands by the D.G.S. Neptune during 1903 and 1904, of which Mr. A. P. Low, the present head of the Geological Survey, was in charge. This has just been issued by the Government Printer, at Ottawa.

Its value is, largely, owing to the leader of the expedition being a geologist whose scientific attainments are beyond question, who had made a reputation during years of plucky, persevering work in Labrador, and whose previous training rendered him peculiarly fitted to be the leader of such a party. Instead of mere guesses at the geology of the places visited, we find concise, clear statements, which enable us to understand a good deal of the geological sequence of the formations adjoining Hudson's Bay and of the various Arctic Islands north of that sheet of water.

It appears, that the chances of finding economic minerals under conditions that will permit of their exploitation are good. The great Huronian rocks that have been found to stretch from Lake Superior to Mistissini are now known to be duplicated through the north. Copper, iron, mica, gold, silver, graphite, molybdenite, and coal have been found; of these copper, iron and mica seem to be abundant. It is, probable, one of the largest copper-producing regions in Canada will eventually be that lying between Chesterfield Inlet and the mouth of the Mackenzie along the shores of the Arctic sea. This will not be a very difficult country to work in, as vessels can penetrate to Chesterfield Inlet and Fullerton during three months out of the twelve, and railway building across the barren lands would be a simple matter.

Mr. Low's description of the Eskimo is most valuable, and we do not remember to have read anything so thorough by other Arctic travellers. Moreover, he takes a broad, comprehensive view of the situation, such as one would expect from a man of the world, with a scientific education; being liberal enough to realize that social customs and natural habits must depend largely upon environment.

He also throws out some hints that the Government would be wise to take note of. In order to protect the natives living in the more distant regions, it will be advisable, undoubtedly, to prohibit any encroachment upon their hunting-ground by Eskimo, who, through contact with whites, have acquired fire-arms.

The meteorological observations taken on board the Neptune, during 1903 and 1904, by Messrs. C. F. King, J. E. Borden, and G. B. Caldwell, show that the climate, as far as mere cold goes, compares favorably with many parts of the Dominion that are inhabited by the Anglo-Saxon race. The coldest day experienced was the 25th February, 1904, when the temperature was —40.7, the minimum being —46 and the maximum being —38. As a rule, however, even in the depth of winter the thermometer was frequently hovering about the zero point. Of course the harbour ice attained an extraordinary thickness, reaching 75 inches by the 22nd day of May, after which it began to melt. The most objectionable points about the Arctic climate are the long winter nights, and the dampness and fog prevalent during a great part of the summer.

If we may be permitted a criticism of a book that is almost flawless, we should say that the natural history notes are less complete than might have been expected. One cannot accept the list of 44 birds as a comprehensive one. If these were all the species the expedition met with, it was, certainly, peculiarly unfortunate. Land animals are hardly touched upon. On the other hand, the geological collection, made by the Commander himself, is particularly valuable, and shows the importance of having a recognized authority in charge of each Department of such an expedition. We believe the Dominion Government would act wisely in building a vessel for Arctic service and in keeping it constantly in commission; two years' cruises with competent commanders and staffs, would enable us to know in a few years the actual resources of the Northern Archipelago, and of the Arctic shores of the Dominion.

A GEOLOGICAL A. B. C.*

A is for Alfred E.—why did he go?
He'd make us the best of directors,—Bar Low.
B's for the Boom that we all were too late in;
C's the Collapse when they Cut the Keewatin.

Nov. 4th., 1906. Nipissing, $34.00.
" 4th., 1908. " 00.34.

D's Dr. Reginald; D is our Doubt
That Dozens Don't know what he's writing about.
E is for him who is well known to fame—
He can write by the yard and a fourth to his name.

Long measure.
12 in. = 1 ft.
3 ft. = 1 yd.
1¼ yds. = 1 ell.

F is dear Hugh, of late there's a rumor
We're to have some more Hugh—then let's have some hu-mor.
G for Geologists, ladies included—
A veteran Belle has accomplished all you did.
H for you Heathens—you'll all go to H——
Here's Hoping our Christian won't go there as well.
I's for Mines Section; an artist he's, too,
Though I fancy his salary's all Elfric Drew.

* Contributed by the Poet Laureate of the C. G. S., whose worth is only equalled by his modesty—wherefore the above is unsigned.—EDITOR.

J is for Joseph, as trusty as steel,
But most of us much prefer lead for a Keele.
L's for Director and Labrador too;
M's Mistassini he travelled all through;
N's for the Neptune, so much to his credit, or
N is the nuisance we know as the editor.
O' for O'S.....n, strange you should get
A man who is Owen, yet never in debt.
P is for Printing,—and Patience,—so few, though
Can Practise much Patience who Print with the Bureau.
Q for the Quibbles the editor raises;
R our Replies when we send him to blazes.
"Trifles light as air."—Othello.
S is the Survey, the pride of us all;
s is our salary—note that it's small;
T' is the Minister, Heaven be praised
We're All Taught To Trust he'll Take care that it's raised!
"It may well wait for a century..."
Brewster's Martyrs of Science, p. 197.
U are the people these verses are writ for;
V are the Verses,—(it's all they are fit for).
"Neither cast ye your pearls before swine."
—Matt. vii., 6.
W's the Work on Museum so neat;
x is the time it will take to complete.
Y's not so Young as he was Years ago;
And **Z**—well, for Z, I'm darned if I know.
"When still in his socks
He descanted on rocks."
—Bab Ballads.

EXAMINATION OF MINES.*

By R. Gilman Brown, E.M.,

I feel myself fortunate in enjoying this opportunity of elaborating before such a representative body some of the fundamentals of mine examination; the more so because they have not always been fundamentals, because it has been largely due to the dispassionate business sense of business men that fundamentals they now are, and because, more than anything else, to the observance of such fundamentals by the investor and engineer alike, is the view of mining as a business and not a speculation to be attributed.

But in these matters the business man is the mainspring. Where there is a demand there will be a product to satisfy it, and the modern mining report is made to answer a simple business question: "What will be the profit?" Stated at length, my subject is: "The Examination of Mines Preliminary to Purchase; To-day as Compared with Twenty-five Years Ago."

It is naturally "to-day" that has the most practical interest for us, but all advance is relative, and if any of you will take the pains to "dig up" some of the reports upon which mines were bought in the early '80s and compare them with modern ones, the advance towards definiteness will be the most impressive point of difference. Then, more stress was laid upon generalities, more weight given to empirical conditions; ore reserves and net values were less considered; a telegram from the man in the field stating that the mine was worth it, would be sufficient to make the capitalist pay out his thousands, by hundreds. Engineers, the best of them, cheerfully advised their clients to take all sorts of chances on persistency in depth on the various uncertainties attendant upon underground work.

It is not that people are now less ready "to take chances," but that it has gradually come to be the belief of engineer and capitalist alike that the chances should be recognized as taken; that if the buyer wishes to speculate for big returns, he should have the opportunity, so long as he is posted on what he is doing. Along with this belief has come the particular recognition of the general law, applicable not alone to mining, that those who would participate in a "dead sure thing" must be satisfied with a small percentum of returns; that those who wish to "plunge," stand to lose all or to gain fabulously, with the whole gamut of intervening possibilities.

I would here pay my tribute to the pioneer engineers with a text-book assistance that was meagre as compared with to-day; with little besides their individual experience and good sense, they were wonderfully successful in their prognostications. Their work is to be no more disparaged than should an engineer now venture to ignore the use of the extensive kit of tools, the accumulated experience of the past quarter of a century has provided for him.

So far as this paper is concerned, the last phase can be dismissed in a few words. It is to-day by no means an infrequent occurrence for business men to "take flyers" in undeveloped mining claims; rich and poor, those who can afford to lose the money and those who can not, seem equally addicted to this sort of thing, but I must emphasize, and all must agree that this is not investment in mines; it is a venture, pure and simple, a speculation without reserve (and without reserves), and though the competent engineer with his wide knowledge of costs, of various regions and of what goes to make up a mine, can, undoubtedly, lessen the percentage of loss in such transactions, it is not to-day his most useful sphere. The most he can do in such a case is to tell his client whether he will have a run for his money, whether the possibilities are such as to constitute a good mining chance. The pity of it is that the lay capitalist does not recognize, as a rule, the essential difference between this game and the sober business of legitimate mining investment.

This is particularly bad because the business man, turning for the first time to mines, is more likely to take up with some such long shot of this

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* A paper read at the Eighth Annual Session of the American Mining Congress.

category than with the other. He pays small attention to the details of the matter—not a fraction of what he would if the same sum were to be put into a warehouse scheme, say, outside, of his regular line—and if the time comes when he must either abandon his "investment" or put up more funds, whichever course he follows, he feels he has been bitten, and in the future views the word "mining" askance. This works another way as well, for he has come to look on mining as outside of business laws, and should he get into a mine that is really an investment, he is still apt to view it loosely as such, and not to inquire too closely into the business details of the management.

Doubly important then is it that the lines be sharply drawn between the two classes of mining, and that the layman in mining matters does not settle down to his layness as the end of the matter. The investigation of one class may take an engineer a week; of the other, months. In the case of the prospect, the report is largely a brief statement of possibilities, with the pros and cons clearly given. In the case of the mine, it is an exhaustive study, an exposition of facts and conditions, with carefully drawn conclusions. It is this latter that particularly concerns us.

The fundamentals of the modern mining report—foal of engineering out of geology; broken by that most exacting of trainers, business sense—demand that the examination should have been conducted on certain lines; that certain matters should have been investigated; that certain tests should have been made; and when a report comes to hand not matching, point by point, with this formula, with some of these fundamentals slighted or missing, the investor will do well to refer it to independent engineering scrutiny, or, failing this, to send it back by the first mail.

These fundamentals are by no means esoteric; in their recital they are not formidable, and to the uninitiated give small evidence of the weeks and months of laborious investigation they have cost the engineer.

They are: The assay plan, showing the tonnage and assay value of the ore reserves; the table of costs; the summary of profits; the chances for the future; the question of title, and, if in the United States, the safety against litigation, arising from our deleterious law of the apex. It will not be without interest to see roughly how these are determined.

The assay plan is the multum in parvo of the report; to its production has gone more plodding work than to all the rest of the examination. It is an accurate, large scale map showing ore bodies with their average values. Average values can only be truly determined by thorough and painstaking sampling, going over the workings yard by yard and laboriously breaking down rock that will represent the whole mass at each point. It is a tedious job at best, but can not safely be slighted. It is frequently claimed that milling tests are better; that tests of the ore as it comes out from the drifts and raises of development work are better, that this, that or the other short cut to the result is better, as well as easier. All of us who have sweated in this sampling of mines will admit that there are many things easier, but the general consensus of those mining engineers who have been conspicuously successful in their prognostications is that there is no short cut that does not involve long and perilous leaps. From this it results that if the property is not in shape to be sampled, it is not in shape to be bought as a mine and it is only a prospect.

Strictly, I should close the paragraph right here, but I am so anxious to carry conviction on this point that I venture a word more. It is plausible to claim that from a tunnel driven on a vein of ore must come ore that will give a fair average of that vein; and this would be the case were the tunnel of uniform height from end to end, but it happens to be almost the rule that were the ore has been more valuable the tunnel has been run higher in accordance with the law of human conduct that puts the best foot forward, with the result that a certain proportion more of the better ore has been included in that coming from the tunnel. What becomes, then, of our average value?

Each of the assay values must be tabled with the width of ore it represents, and for each block in the mine averaged. Here no mere arithmetical average will do, summing the results and dividing by the number of them, for that would give the same weight to a six-inch high-grade streak and the six-foot low grade. The true average must be gotten: For each sample, width is multiplied by value, these products are added and divided by the sum of the widths. This is kindergarten teaching so far as engineers are concerned, but hardly so, I fear, as regards the investor, to whom particularly I am speaking.

The determination of the tonnage, represented by the ore blocked out, is largely simple surveying work, but the engineer must use great caution in what he includes as ore reserves. Fortunately, the old, easy term of "ore in sight" is passing into disuse, thanks to the influence of a prominent mining society, and the modern engineer is expected to designate closely just what degree of certainty he has about the tonnage of each block. It is obvious that a tunnel driven one thousand feet in ores does not in rigid interpretation block out any ore, though an engineer is frequently justified in assuming certain distances above and below as "probable" or "reasonably to be expected;" but each such estimate is in its own category. The ore blocked out, as commonly understood, is ore with three or four sides showing in the workings. All of these data are collated on

the assay plan; on the map showing the tunnels and workings to scale, are plotted in proper position, each sample with its width; the value for each block is given and the tons and average width, the one determined by multiplying the average width by the area of the block measured on the vein and dividing by the cubic feet going to make up a ton of ore in place; the other being the true average of the assays for that block. I venture to insist here, with an insistence that may to some savor of dogmatism, that an assay plan should be prepared in every case where a mine is being bought for its ore; nothing better than this shows whether the examination has been slighted, nothing is more readily comprehensible to the lay purchaser.

The costs of extraction in the case of an operating mine might seem to be a mere determination of results that a competent bookkeeper could prepare and to a certain extent this is so. But more often than not, the value of a particular mine hinges upon the introduction of improvements, increasing the capacity of the plant, and on economies to be gained in the present scale of operation. Light can be shed on these only by a proper segregation of the items of cost.

To a varying degree, each mine is a lonely entity, with strong individual characteristics at times amounting to eccentricities. This is true even of mines in a single district, even in a district of the South African Rand, and thus it results that the engineer can not safely say costs will be so and so because these have been attained elsewhere.

In the case of an operating mine the engineer segregates the items over an extended period into reasonably narrow categories. A comparison of each of these with the work of other mines may give him a hint as to what items are normal and what are not, but for definite figures he goes out through the works and mine, noting the duties of the men and their efficiency, both eyes open, his mind bent to a big interrogation point. In the light of this investigation, he makes fresh calculations of what ought to be the costs on the present scale of working. Then he proceeds to a fresh segregation that will separate from the whole mass the fixed general expenditures, those that do not depend upon the yearly tonnage. As these will be practically the same in total, they will obviously be less per ton with a larger tonnage, so that, when the ore reserves are big enough, increasing the scope of operations, affords a most profitable field for the investment of capital. The importance of this warrants reiteration in a different form: general fixed costs are constant in total, and inversely proportional to tonnage in per ton figures. Other costs are directly proportional to tonnage in total and constant in per ton figures.

This estimate tests most severely the ability and judgment of the engineer, and everything depends upon its correctness. It can not be ignored and yet in the hands of the mere office man becomes academic and a snare. An error here is quite as serious as in the sampling, and, as examinations are now-a-days conducted, it is easier to "salt" the cost sheets than the mine—and fully as effective.

The profit in the ore reserves of various kinds is a plain calculation from these premises, and, notwithstanding the serious drawback that the sampling can physically only represent the real values of the boundaries of the blocks of ore, has been found, except in unusual cases, to closely approximate the facts.

I have reserved until now speaking of the interval at which samples are taken because the importance of this factor is now more clearly to be seen. The experience of the engineer and his preliminary inspection of the mine and assay books has told him what is likely to be the proper interval for his sampling. If the ore is high grade and spotted, he naturally takes a closer spacing, and two-foot intervals are by no means unknown. Such close spacing is at times called for by even low grade mines if the values are very irregular. The engineer recognizes that in a multitude of samples lies safety and, very frequently, as the work progresses, finds that the interval selected is too wide and has to go back over his work and interpolate other samples. But he considers it an absolute essential that the distance apart shall be uniform for each individual block, it being obvious that if he has twenty high grade samples from a 100-foot tunnel and ten low grades ones from another 100-foot length, by even correct averaging, the result for the 200 feet will be too high. At times it happens that the high grade ore will be more erratic in its sampling than the low and that it would be a waste of time and expense to sample the low grade at as close an interval as the high. In these cases he is frequently justified in estimating each separately and then combining the two in the proportion of length that each represents. There is more than one way of doing this and it will hardly be interesting to explain fully such merely technical things.

It is rarely, however, that a mine is sold for merely the profits in the reserves; certain assumptions are made about continuance of ore, and it is the difficult task of the engineer to decide what assumptions are justified, by the conditions. Indeed, it may be pertinently asked why anyone should sell at all for only as much as he has already assured, and, on the other hand, why another should care to buy if he only expects to get back what he pays out. The answer to this question is outside the scope of this paper, but it can be briefly said that in the answer is involved the essential difference between the buyer and seller in any transaction, as well as certain peculiarities inherent in mining transactions alone. The vendor's knowledge of his mine is more sketchy than that of the buyer after his examination

and while he is apt to be more hopeful of the prospects, this may be more than offset by imperfect realization of the possibilities of improvement. Aside from this, and in the case of the professional promotor, he is apt to figure on a price that will give him a good profit on his outlay and trouble. Logically and practically, then, it is the prospect that is bought and we here come into close contact with the work of the engineers of the '80s and with that of the man who sets out to value a prospect.

A moment's consideration, however, shows that there are certain facts that here help out. The history of the mine affords certain clews to the future. The workings give vast advantages for the study of the particular geology. Moreover, almost a new science has been elaborated in recent years, that of economic geology. The servants of this have been enthusiastic and earnest and are opening out avenues of discovery that make our resources of twenty-five years ago appear, by comparison, sophomoric. This branch of geology is, however, only new so far as its general use is now common to the engineer. The painstaking studies of a generation of students go far to make it now possible, but what was being done in the '80s was the devoted work of a few; that of the present is being done by an army of investigators. By this the examining engineer now profits; indeed, he is very frequently assisted by a geological specialist in his investigations.

All the data of the assay plan are studied for the light to be thrown on the future as to change in dimensions of the ore bodies and of tenor in their contents and to these questions of persistence, they give prompt, if empirical, answers. The geological study of the vein, the existence of dikes, of cross-veins, of changes in wall rock, all of these have a bearing on the future. Then there is the pertinent inquiry as to the extent the deposit owes its value to surface conditions, which are now recognized as often reaching to profound depths. It is practically impossible to do more here than state the prime factors in the case which must all be combined into a trustworthy opinion. This is a severe test of judgment. No mine examination is to be lightly approached but when the engineer reaches this consummation of all his work, the responsibilities of his position have, in truth, come home to him. He is now to form his conclusions, the answer to the question with which he began: "What will be the profit?" He has certain definite facts arrived at by painstaking investigation. He has a number of facts of less definite demonstration and he has a swarm of the small impressions that have buzzed around him during the examination. He must give due weight to each and combine the whole into a decision with logical sequence of conclusion to premise, so that no one can say "non sequitur." Just how this is done constitutes the personal factor, and who shall declare its course of operation? It is far removed from mere guess work, it is the special faculty of the well balanced mind; with no direct relation to personal predilection, we know it as but that imponderable quality of "judgment."

But this talk about judgment must not blind us to the clear separation of fact from future.

With all his innate habits of mind, the engineer strives to give to his report the one, distinct from the other; and this is made clear no less in the use of his data than in the deduction of his conclusions. He virtually says: "These are the facts as nearly as they can be determined; there are the uncertainties; the true weight of the uncertainties is thus and so, the chances are such and such. The problem is before you, make your decisions, what will you do? With this the scope of the engineer is reached, his work is done; he has investigated, and found the facts." He has studied, and evolved the probabilities; he has stated the one and the other with logical succinctness, and it is now up to the other man, as it always must be up to the man who provides the funds. When all is said and done, his decision is final.

I started out with the aim of showing what were the recognized fundamentals of the mining report of to-day, devised by experience to lessen the hazards of purchase; I have tried to show how guess work has been eliminated, how certainty has been sought, whenever attainable; what the limits of definite information are and what degree of reliance is placed on the purely personal factor of judgment. I have explained how the mining engineer, in his appraisement, makes the practice of separating the positive from the tentative factors, of presenting the one categorically, imperatively, as becomes the expression of ascertained physical facts, the other modestly, as things probable but concerning which the best judgment may be at fault.

If this serves to give the investor a better idea of what to look for in a mining report, I shall be pleased; if it aids him to place due value on the work of the engineer, I shall be gratified. If it leads some few to appreciate the essential qualities of mining as business without inordinate risk, I shall be more than satisfied.

THE OCCURRENCE OF PLATINUM.*

Platinum is largely employed in chemical industries for the construction of vessels in which corrosive liquids such as strong acids are to be dealt with. The metal is sparsely distributed, and in recent years, owing to the great extension in industrial chemistry which has taken place, the demand for platinum has exceeded the supply and its price is rapidly becoming almost prohibitive. In addition to its use in chemical industries the metal is also employed in electrical work and to a small extent in

* From the Bulletin of the Imperial Institute.

photography. It has also been used in jewellery. In view of the increasing demand for the metal special interest attaches to its occurrence in hitherto unexploited situations.

Platinum Minerals.

The mineral known as "native platinum" consists of an alloy of platinum, iridium, palladium, and sometimes osmium, gold, iron and copper. The usual forms of the mineral are nuggets, scales or irregular grains. In color it varies from silvery-white to dark-gray and it has a metallic lustre. The hardness varies from 4 to 6; the fracture is hackly, cleavage none. It is malleable, ductile and sectile, and has a specific gravity of 14 to 18.

The composition of platinum nuggets from various localities is shown in the following table: —

Source.	Russia.	British Columbia.	New South Wales.
Platinum	76.40	72.07	75.90
Iridium	4.30	1.14	1.30
Rhodium	0.30	2.57	1.30
Palladium	1.40	0.19	trace.
Osmium	.....	.....	.....
Ruthemum	.....	.....	.....
Iridosmine	0.50	10.51	9.30
Gold	0.40	.....	.....
Iron	11.70	8.59	10.15
Copper	4.10	3.59	0.41
Sand	1.40	1.69	1.22

The metal also occurs in some few locaities as the mineral sperrylite, an arsenide of platinum ($PtAs_2$) containing a little rhodium and antimony. This mineral has been found at Sudbury, Ontario; North Carolina, and at the Rambler Mine, Wyoming, U.S.A.

Sperrylite is of a tin-white color, has a metallic lustre and gives a black streak. Its hardness varies from 6 to 7; specific gravity 10.6. It crystallizes in the pyritohedral class of the cubic system presenting considerable resemblance in form to iron pyrites. When slowly roasted in an open tube sperrylite gives a sublimate of white arsenic and melts easily. At present this source of platinum is of little or no commercial importance.

Mode of Occurrence.

(1) "Placers."—Almost the entire output of platinum is obtained from "placer" deposits, typical examples of which are those of the Urals, Columbia and Brazil and British Columbia. The platinum "placer" deposits is probably in most cases derived from basic igneous rocks.

(2) "Veins."—Platinum (as sperylite) has been found associated with covellite at the Rambler Mine, Wyoming. It occurs native with gold at Tilkerode in the Hartz Mountains, Minas Geraes in Brazil, Santa Rosa, California, and Beresovsk, Russia, also with tetrahedrite and bournonite at Guadalcanal, Spain.

(3) Platinum disseminated in eruptive rocks.—(a) It occurs associated with nickeliferous pyrrhotite, copper pyrites and other nickel-copper ores in a hypersthene gabbro or norite at Sudbury, in Ontario. (b) Native platinum is met with in peridotite and other basic eruptive rocks rich in olivine intimately associated with chromite.

Localities From Which Platinum Has Been Obtained.

EUROPE.

Platinum has been found in very small quantities in Austria, Hungary, France, Germany, Great Britain and Norway.

Russia.—Over 90 per cent. of the world's output of platinum is obtained from Russia. The production in 1904 amounted to 161,139 ounces troy of the crude product. The metal is known to occur over a wide area, but the districts in which it is obtained on a commercial scale are comparatively few; the chief of these are situated along the eastern watershed of the Urals, the eastern portion of Perm and on the western watershed further south. The most important are the Nijni-Tagilsk, Goroblagodat and Bisersk districts.

The richest deposits of the two latter districts lie along the river Iss. The area is largely composed of peridotites, olivine-gabbros and their serpentine products.

The deposits, which average 4 feet in thickness, are of the "placer" type, and extend from 200 to 800 feet on each side of the present river. They have an overburden of peat or turf which varies from 5 to 20 feet in thickness.

In extracting the mineral the turf is stripped off, and the gravel transported to the sluices or to the mechanical washers, the latter being more usually employed in operations on a large scale.

The washer consists of a cylindrical tub at the botom of which is a circular iron pan 15 inches deep, perforated with holes five-eighths of an inch in diameter. Round the top of the pan runs a cast-iron pipe from which jets of water play into it. In the centre is a vertical shaft carrying a stirrer, which revolves about twenty-five times per minute. The gravel is fed continuously, and while the large stones remain on the pan the sands and clayey matter pass with the water through the holes direct to the riffle tables. Washing is carried on without intermission for about eleven hours, the concentrates are then washed on the tables several times, until reduced to a fine gray slime from which the gold is removed by means of mercury.

The residual material is sold as crude platinum. Dredges have recently come into use in the Iss valley in connection with this industry.

Spain. — Platinum in small amount has been found at the silver mines of Guadalcanal.

ASIA.

Burma.—Platinum is known to be associated with the gold of the "placer" deposits at Ava in Upper Burma.

Borneo.—It also occurs at Goenoeng, Lawack, in south-eastern Borneo, and is occasionally obtained in gold washings.

Japan.—Platinum together with iridosmine is reported to occur in the sands of the river Yubari, Ishikari.

AFRICA.

Algiers.—Platinum is said to occur with galena near Algiers, but the report lacks confirmation.

British Central Africa.—Traces of platinum have been found in a nickeliferous pyrrhotite received recently at the Imperial Institute from British Central Africa. No information as to the amount of this ore obtainable is available.

AMERICA.

Canada.—Platinum has been found in the sands obtained near Edmonton on the North Saskatchewan River in Alberta province. The gold washings of south-west British Columbia yield platinum in small quantities. The production in 1904 amounted to 35 ounces of the crude material valued at £2 10s. per ounce. This quantity was obtained from one working, viz., Granite Creek in the Similkameen, from the sluice boxes employed in washing for "placer" gold. In 1902 platinum was found in the black sands at several points on the Quesnal River, Cariboo district. Assays of these sands showed gold to be present in amounts varying from 0.2 to 121 ounces per ton and platinum from 0.14 to 7.8 ounces per ton. The Consolidated Cariboo Co. in 1904 reported the presence of appreciable quantities of platinum in the heavy concentrates remaining in the sluice boxes after the "clean up," and they are now taking steps to collect and treat these concentrates. The platinum, palladium and osmiridium occur in minute metallic grains which are enclosed in fragments of chromite and magnetite.

Platinum has also been found in the copper sulphide obtained from the Yale district; the amount present, however, would not admit of its commercial extraction, unless it were recovered from the slimes after electrolytically refining the copper.

Platinum occurs as sperrylite in the copper-nickel ores of Sudbury, Ontario. The nickel-copper matte, as exported contains about one ounce of platinum per 1,000 lb. Some of this is now recovered by the Oxford Copper Co., of Constable Hook, N.J., in refining this matte.

The metal is reported to occur on the south bank of the St. Lawrence river in the Eastern Townships of Quebec.

United States.—The United States in 1904 produced 200 ounces of platinum valued at $2,600. The greater quantity of the metal was obtained from the gold "placer" deposits in Trinity and Shasta counties, California. Platinum is known to occur in the "placer" deposits of Washington, Oregon, Idaho, Montana, Colorado, and Alaska, but in quantities insufficient for commercial working.

It also occurs as sperrylite ($PtAs_2$) associated with covellite (CuS) in the Rambler District, Wyoming, and it was estimated that platinum to the value of $6,000 was contained in the slimes from the copper ore raised in 1904.

South America.—The production in 1904 amounted to 9,625 ounces; this was largely obtained from Colombia. This country ranks second to Russia as a producer of the metal. The most productive district is El Choco in the provinces of Atrato and San Juan, the latter being the larger producer.

AUSTRALASIA.

New South Wales. — The production of crude platinum in 1904 was 535 ounces valued at $10 per ounce as compared with 530 ounces in 1903.

This yield was almost entirely obtained from an area of about two square miles at Fifield. The working is a deep alluvial lead containing platinum and gold, the sinking being through 60 or 70 feet of loam, having some bands of barren quartz and drift. The wash dirt contains 5 to 12 dwts. of platinum and 1 to 3 dwts. of gold per ton, but owing to the scarcity of water the deposits are only worked during a few months of the year.

Platinum has also been found in the sands at Aberfoil river, on the sea coast between Richmond and Clarence rivers, and in felsite and granite at Broken Hill.

Queensland.—Traces of platinum together with gold and tin-stone have recently been reported in the beach sands of the south-east coast. The sands contain from 0.12 to 0.64 per cent. of tin-stone (3.4 to 8.12 lb. per ton), and from 5 grains to 1 dwt. 19 grains of gold per ton and 3 dwts. to 7 dwts. 2 grains of silver.

Tasmania.—Platiniridium is obtained along the Savage river and platinum from the sands of the Wilson river. The "placer deposits" of western Tasmania are of commercial importance on account of the iridosmine they yield. Platinum has been reported to occur together with vanadium in the ash of certain Australian coals.

New Zealand.—Platinum is known to occur over a wide area, usually associated with gold washings.

Some of the river sands in the southern part of Middle Island and those of the east coast of Otago are said to yield the metal; it has been reported also to occur in eruptive rock near the Takaka river.

The following observations made by Mr. J. F. Kemp, of the U.S. Geological Survey, as to the indications of the occurrence of platinum give a useful summary of what is known on this subject:—

(1) Experience so far gained leads to the conclusion that platinum is very sparsely distributed in its mother rock and the chances of finding it in quantities sufficient to mine are small.

(2) Large and permanent "placers" are to be looked for only in very old land areas which have been subjected to protracted degradation and concentration.

(3) In the assay of antimonial, arsenical and other copper ores, but especially of tetraherdite (gray copper or "fahlerz"), it is worth while to look for small percentages of platinum.

(4) Deposits of chromite deserve similar testing.

It may be stated that pyrrhotite, the lower sulphide of iron, often contains traces of platinum, especially when nickel, copper and cobalt are present.

It must be remembered that mercury does not readily amalgamate with platinum. Therefore in methods of working auriferous "placer" deposits in which the gold is saved by means of mercury, the platinum is liable to be lost unless special means are taken to preserve it. If, therefore, traces of platinum are suspected or known to occur, the gold and platinum should, as in Siberia, first be collected by riffles or "blanketing" and the separation subsequently effected by means of mercury.

Even in the use of riffles or other mechanical means of retaining platinum more care is required than in the case of gold.

PROSPECTING WITH CHURN DRILLS.

By F. S. Pheby.

Several diamond drills are at work in the Cobalt district, but, it is quite possible, under certain conditions, churn drills would serve the purpose. In this connection, a very useful paper by Mr. F. S. Pheby, may be read. It was contributed to the Mining and Scientific Press of San Francisco. Of course, the items of expense would differ very considerably in Cobalt, and, on the whole, the cost should be less in Northern Ontario than in Nevada. Mr. Pheby writes:

Believing that the great horizontal ore-bodies of the Ely district could be more cheaply and expeditiously tested by the use of the drill rather than through the usual tedious and expensive method of shaft-sinking, the Ely Central Copper Co. purchased two drills, manufactured by the Keystone Drill Co., Beaver Falls, Pennsylvania. These drills were hauled from Cherry Creek, to the mines, a distance of sixty miles. These machines are type No. 3 and weight 12,000 lbs. each. A complete outfit of tools and equipment for recovering any parts of the drills lost in boring the holes, were included in the order.

The first drill was installed on the property in August and we had a hole completed to a depth of 308 ft. within 23 days, although but one shift was engaged in this work. It is far more economical in wood and water to keep the drills running continuously with three shifts. More than three times the sinking can be done in the same number of days, as steaming up in the morning generally comes out of the one shift. The drill averaged 13.3 ft. per shift for the 23 shifts, but if shut-downs are deducted, the drill averaged 19.6 ft. per shift of actual operation.

We have found in all our work that casing is necessary in every hole. At times we have sunk 200 ft. without casing, but to go deeper casing was necessary, which meant that the hole had to be rimmed out at an expense of more than the original cost of the hole for the 200 ft. I caution anyone contemplating the purchase of a drill, to provide 7⅝ casing for one-third the depth contemplated, 5⅝ casing for two-thirds the depth, and 4¼ casing for full depth. This we had not done, and probably 25 per cent. has been added to the cost of each hole, worked without sufficient casing. Trouble may not be encountered in several hundred feet, but a soft stratum of ten feet will require casing for the entire hole.

We soon learned that the wear and tear on the drilling cable was severe. Under ordinary circumstances, each rope is safe for 1,500 feet of drilling. When we appreciated that our ropes were deteriorating, an order was placed at once. By October 1 the cable had not arrived, and we were compelled to order by express from Ohio a coil of rope weighing 1,850 lb. With each drill, two ropes of the same length as the depth of the hole contemplated should be ordered.

Water is required for both the boiler and for diluting the drillings so that the sand-pump may bale them. The greater quantity is required for the boiler. This item of expense is local with each hole. It is advisable to haul water in a good wagon-tank, as the drills may be moved many times, and the cost of pipe might be greater than the cost of hauling. A drill-man and helper are required on each shift; the former receiving $4 for eight hours' work and the latter $3.25. The item of fuel and water is wholly relative, but will be given in our particular case, and may be taken as an average for this district.

The following is the tabulated costs for a certain hole which we have taken as an average:

Shifts of sinking (eight hours each)	23 days.
Depth of hole	308 feet.
One drill-man, wages	$ 82.69
One helper and assistance while handling casing	81.08
¾ cord of wood each shift, at $4.50 p. cord	77.51
12 bbls. water at $6.50 for hauling, 8 days.	52.00
12 bbls. per day (when running two rigs), 15 days	48.75
Coal and oil	7.60
Miscellaneous charges	12.20
Superintendence	50.00
Cost of 308-ft. hole	$411.83
Cost per foot	$ 1.33

Some water was encountered in this hole, and I may say roughly, that a two-compartment shaft for

the same depth with equipment, would have cost about $12,000, or $40 per foot.

The question has often been raised concerning the character and accuracy of the sample obtained from this work. With small rich veins there may be an objection to the use of drills, but in ore-bodies like those found at Ely, I believe as good a sample can only be taken with great care. Most of the sludge or drillings will pass a 20-mesh screen, and a good method is to provide a large box with a capacity equal to several screw-lengths. I might say that a screw is three feet long, and when fed out, the clamps are changed on the rope, and the hole baled, or sand pumped. By settling and decanting the water, the entire product of the hole may be saved and sampled. In ordinary practice it is sufficient to dip a sample from the box and pour the same into a box partitioned off in compartments about the size of common brick. This sample, when dried in the sun, is compact enough to be sampled by chipping, and can be shipped and carried about without breaking.

In a hole carried down without casing, there is danger of knocking down particles from the upper portions of the hole. This will vitiate the sample, but the harm done is more theoretical than actual. As is well known, the ore-bodies of Ely are the impregnation of a great stockwork of porphyry, and an ore-body of much value must be a hundred or more feet thick. While actually in ore, the sampling must be done with extreme care, but often the hole, all or in part, may be in barren country rock, and only a knowledge of the formation penetrated is desired.

The best test, where not in ore, is obtained by panning the sample. This concentrates the coarse particles, which are clear to the eye if a magnifying glass of low power is used. In oxidized formations some doubt often arises as to whether the drillings are composed of porphyry or limestone. A small bottle of dilute hydrochloric acid will soon settle this question with entire satisfaction. We have made a practice of saving a sample of each formation penetrated, in four-ounce bottles. This gives a clear picture of the hole, and is valuable for future reference.

Our drills are provided with traction gears, and may be moved at will over the roughest ground. This saves the expense and trouble of procuring teams. The winter weather is severe for outside work, and sectional houses, so made as to be readily knocked down and moved, have been constructed to enclose the drills, and within these houses the men work in comfort.

The cost of a No. 3 drill is as follows:

Drill f. o. b. Beaver Falls	$1,400
Cost of casing for 400 ft. and fishing tools	350
Freight to Cherry Creek, Nevada	328
Hauling 60 miles from Cherry Creek	225
Cost of No. 3 drill, good for 500 ft., laid down on the ground	$2,303

A drill of this size is light for holes of greater depth than 500 ft. The size recommended is a No. 5, good for 1,200 ft., and the cost of the same with traction gear, is about $2,500 laid down at Ely. Should five holes of 500 ft. each be sunk, the cost of equipment per hole will be $500, about the price of a good whim outfit. The cost of $1.50 per foot is so much cheaper than any shaft work as not to be comparable. Water does not retard the work of drilling; in fact, it is a benefit.

I can heartily recommend the use of three drills for prospecting in this region. Apart from the cost per foot, the time in which a good working knowledge of the ground can be obtained, is a great factor. The sample is quite as good as a core, and most ground can be penetrated at 25 per cent. of the cost incurred with a diamond drill; while the expense of equipment will not exceed 30 per cent. that of the diamond-drilling outfit.

THE PRODUCTION OF PLATINUM*

By F. W. Horton.

The year 1905 saw a phenomenal rise in the price of platinum and a greatly increased production in the United States. The annual report of the United States Geological Survey on the production of platinum, shows that early in March, 1905, the price of ingot platinum advanced from $19.50 an ounce to $21 an ounce, surpassing gold in value. On April 1, 1905, the price fell to $20.50, and remained firm at this quotation until February 1, 1906, when it jumped to $25 an ounce, where it remained until Sept. 1, or about six weeks ago, when it leaped to the unprecedented value of $34 an ounce. The production of platinum in the United States increased from 200 ounces in 1904 to 318 ounces in 1905.

The rise in the price of platinum and its increased production in this country may be ascribed to two causes; the growing demand for the metal and the reduced yield of the Russian platinum placers, which usually furnish about 90 per cent. of the world's supply.

The anxiety felt by the platinum dealers during the Japanese-Russian war has not abated since the settlement of international difficulties, but has rather increased as Russia's internal dissensions have developed. Even before the uprisings, it is said, the large Russian mines were purposely curtailing their production. This reduction of the output is due to the fact that the entire product for a varying term of years was bought up under contract and at prices that now seem ridiculously low. As the mine owners receive only the fixed price, they do not participate in any gain due to rise in value, and are therefore not desirous of a large production, but are husbanding the limited resources of their mines until

* From Advance Sheets, Mineral Resources of the U.S.

such time as they can dispose of their product to better advantage. Meanwhile the small mines, which, generally speaking, are not hampered by such agreements, are working to their full capacity to take advantage of the stimulated prices; but their entire output is only a small percentage of what is usually produced. A greatly increased consumption of platinum in the electrical and chemical industries, together with this stringency of supply, accounts for the prevailing high prices.

The exhaustive tests and examinations of black sands commenced early in 1905 in connection with the Lewis and Clark Exposition, and still being carried on at Portland, Oregon, by the United States Geological Survey, have done much toward placing platinum mining in this country upon a stable footing and developing it into a permanent and profitable industry. Not only have many discoveries of platinum in new localities been made, but the tests have revealed the fact that there are in this country districts which contain surprising quantities of platinum, and they have also given much valuable data as to the best method of obtaining it.

Platinum is now known to exist in 15 counties in California: Butte, Calaveras, Del Norte, Humboldt, Mendocino, Nevada, Placer, Plumas, Santa Barbara, San Luis Obispo, San Bernardino, Shasta, Siskiyou, Trinity and Yuba; in nine counties in Oregon: Baker, Coos, Curry, Douglas, Jackson, Josephine, Lincoln, Linn and Union; in eight counties in Idaho: Ada, Bingham, Boise, Elmore, Idaho, Nez Perces, Oneida and Shoshone; in four counties in Colorado: Chaffee, Park, Saguache and San Miguel; in three counties in Washington: King, Skagit and Whatcom; in two counties in Montana: Custer and Granite: in Utah, in Garfield County; in Arizona, in Yavapai County; and in Wyoming, in Albany County. The metal is also rarely found in Alaska and in the gold-bearing sands of Corozal river, Porto Rico. Isolated occurrences of single nuggets or mere traces of the metal have been found in many other counties of these states, as well as in four of the eastern states, namely, New York, Pennsylvania, North Carolina, and Georgia. In many of these localities the metal occurs but sparingly. The most promising fields are in the counties of Southern Oregon and Northern California. Here the metal has been found in commercial quantities. With proper methods a considerable annual output should be obtained.

The platinum metals are usually found in working gold placers, especially where the gravels are derived from peridotites. Many managers of placer mines have been convinced for a long time that it would pay to save the platinum in gravels, if it could be done by some inexpensive method. The experiments of the Geological Survey which were conducted under the supervision of Dr. David T. Day, have shown conclusively that 95 per cent. to 98 per cent. of the precious metals, both gold and platinum, contained in the sluice box sands can be saved on concentrating tables of the Pinder or Wilfley type, such as are used in every day practice; and that in most cases the concentrates thus obtained will represent less than 1 per cent. of the total weight of sand fed to the table.

Besides discussing the experiments made in the recovery of platinum in this country, Mr. Horton describes the methods of extraction in vogue in Russia. He also reviews the localities in which platinum-bearing gravels have been noted in Russia, Colombia, British Columbia and other countries, describes the physical properties of platinum and its associated metals, and sets forth their uses. A brief bibliography of platinum, with which the report closes, is not its least valuable feature.

It should be noted that the imports of platinum during 1905 were valued at $2,173,263, as against $1,879,155 in 1904, an increase in value of $294,108. Considering the increased demand for platinum, the gain in importation is slight, but if the high price and scarcity of the metal be taken into account the wonder is that there was not a large decrease in the quantity imported.

A STORY OF ENDEAVOR.

By Nemo.

This untrue and most unveracious narrative has to do with the activities, methods, success and failures of certain brainy and adventurous men, who, with all the qualities for greatness, lacked but one element of success, as mining promoters,—they really tried to get a mine. There were three. Money they had none, work they would not, and to beg, well, perhaps, they were not ashamed, but they were ambitious, and they had probably hit every man who could be "broke up" for a small loan; that occurred to them, so often, that this well was dry.

And they had to do something last spring, not from choice or the working of an unquiet spirit, but because they had to.

It was about the time the ice had broken up on the Timiskaming Railway, and the first crop of Cobalt promoters, with their slabs of silver, had struck Montreal, before the Nipissing cargo, in the charge of an expert, had moved on Cobalt. But these three men saw that the bait was good, they knew the crop of suckers was large, even in staid, hard-headed Montreal, and they had to do something. They did it.

They organized the Cobalt Unlimited, with a capital stock of $7,000,000, under their hats, so to speak—(let it be trusted they were new)—and they at once started off to sell rights to stock. They had neither a mine, a charter, a company nor a stock certificate, but they sold rights that netted them a cool $3,000. Could the names of the gentlemen, who parted with this sum of good, cold dollars, be but printed in full, this issue of the Mining Review

would displace every alleged humorous publication that at ordinary times comes to Montreal. The very babies would cry for it, and if there wasn't such a cruel law of libel in this country the list would be printed. We believe that it would be possible to prove the truth of the list, and that it was in the public interest, but it would take too much time to do it. Let this be enough. There are names on the cheques that were parted with for "rights" "when issued" to stock in Cobalt Unlimited, that are supposed to mean close-fisted, shrewd, hard-headed, conservative, thoroughgoing business, with big profits and big sales, in the commercial world.

With three thousand dollars in their hands, the business went on gloriously. The gentlemen felt that they had found the goose that laid golden eggs at last, and they rejoiced much and proceeded to spread things. They paid back some of their "loans," bought new overcoats, smoked twenty-five cent cigars, instead of six for a quarter, and were prosperous, very. Incidentally, they took an office, got in a typewriter on 30 days' trial, and proceeded to cultivate the goose. Perhaps the office and the typewriter frightened the gentle and sensitive bird, perhaps it was the fact that the $3,000 (minus expenses) behind them affected their husbandry. Whatever was the cause, from the time they started in with "an organization," the eggs ceased to arrive. Instead of recognizing that there was a perhaps, these three bold and energetic souls pitched in on the organization side. They applied for and obtained a charter for the "Cobalt Unlimited." We believe that this charter is a work of art that discounts Byam Shaw, the Canadian archives, or the Bucket Shop Code; that it stands a monument to what can be done, when you try. They contracted for a block of stock certificates, something in aluminum dust and purple ink, which if used for wall paper would stop a clock, and, incidentally, about this time they got in another typewriter on 30 days' trial, and "threw down" a hard working and enterprising typewriter man, after using his machine for thirty days. About this time, also, the inroads of a month's hilarious organization made itself felt on the bank account, and the goose was behaving worse than ever. What should they do?

Still working on the organization idea, they decided that they had better buy a mine, and one of their number actually went up to Cobalt, and bought it. More than that, he paid for it, that is, he paid $1,000 for an option to pay $100,000, more or less, for a forty-acre section of fine looking rock, within the traditional sixty days. And not satisfied with this cruel devastation of the company's funds, he allowed a man with some letters after his name, to do him out of $250.00 for a "report" on the magnificent property.

This report was not an exhaustive or wordy document. It was a simple statement that the property in question consisted of a mass of fundamental granite without any particular crack or flaw in it, and if any mineral was ever to be found thereon, it would have to be put there first.

By this time there wasn't any of the $3,000 left, not even enough to pay the printer for the certificates. The first fine, careless rapture was gone; the man who had put in the third typewriter on trial wanted his money; the weather was warm, and there was a taint of Nipissing in the air; and the adventurous three forsook their organization, abandoned their charter, and vanished, as far as possible, from the usual haunts of certain gentlemen anxious to get something for "rights," followed by "when issued."

This is the sad tale, so it is. Had these adventurous souls gone on as they began, they might be endowing colleges by this time.

ASSAYING COBALT CAMP ORES.*

By F. F. Colcord.†

The ores from the Cobalt district are extremely varied, both in the metal contents and in the character of the gangue. Below are some typical analyses of ores from different parts of the district.

Ag. Oz. per Ton.	SiO_2 p.c.	Fe pc.	CaO p.c.	As p.c.	Ni & Co p.c.
300	4.0	4.0	5.0	55.0	14.1
350	53.0	12.4	2.2	5.7	4.1
400	46.1	5.8	4.0	6.2	....
3,000	10.0	6.0	5.0	41.0	....
3,000	28.3	....	21.7	2.4	....
5,600	8.3	....	10.3	27.8	....

The one point of similarity in these ores is that on grinding and sifting, metallics remain on the sieve. These metallics, as a rule, contain about 70 per cent. of silver. In some ores large pieces of native silver are present. All this makes sampling an extremely difficult task. The method of sampling used is a form of the alternate shovel, combined with the coning and quartering method

Sampling.

The whole lot to be sampled is crushed and rolled to 0.25 in size and thoroughly mixed. It is then piled in a ridge about 30 ft. long, and again turned over and mixed. The ridge is then halved by alternately shovelling to either side, forming two parallel ridges, of which one is rejected and the other halved as before. This is continued until a 5,000- to 6,000-lb. sample is obtained. This sample is then coned and quartered to about 1,000 lb., which is put through the rolls until it all passes an 8-mesh sieve. If any metallics show on the sieve they are ground in a drug mill and mixed with the fines. The sample is next worked down to about 40 lb. with a Jones sampler, and sifted through 20-mesh. The metal-

* From the Engineering and Mining Journal.

† Chief chemist, American Smelting and Refining Co., Maurer, N.J.

lics, if any remain on the sieve, are ground and then thoroughly mixed with the fines. The 40-lb. sample is halved once with the sampler, one half being reserved and the other prepared for the final sampling by again sifting on a 20-mesh sieve and treating any metallics as before. The sample is then quartered down with the sampler to about 5 lb. and accurately weighed. The 5-lb. sample is sifted on an 80-mesh sieve, the oversize, consisting of ore and metallics remaining on the sieve, is ground for two hours in a pebble mill. After grinding, this portion is again sifted. The oversize is pounded in an iron mortar to free it from adhering fines and then sifted. The oversize (metallics) is weighed, mixed and divided into the requisite number of samples. The fines likewise are thoroughly mixed and divided.

All the rejected portions are again shovelled to the original ridge formation and the entire operation repeated three times. Thus four separate and distinct samplings are made of the lot from start to finish. The four samplings should agree within reasonable limits.

Assaying.

Two methods of assaying the fines are used according to the grade and character of the ore. The first method is usually applicable to ores under 400 oz. in silver and is as follows: Four ½ A. T. portions are fused in F Denver crucibles with 200 grams to each charge of the following flux: Bicarbonate of soda, 10 parts; litharge, 20 parts; potassium carbonate, 3 parts; silica, 3 parts; borax glass, 4 parts. Enough reducing agent is added to each charge to reduce a 30-to 40-gram button. A cover of salt is used.

The lead button obtained is scorified once in a 2½-in. scorifier, cupelled and weighed as usual.

The second method for ores over 400 oz. in silver is a variation of the combination method for silver. Six to eight ½ A. T. portions are weighed into 1000-c.c beakers. The ore is covered with 100 c.c. of nitric acid and heated to boiling. The boiling is continued for 20 minutes or until decomposition is completed. When decomposed, 300 c.c. of water is added to each, the solution stirred and allowed to settle. The solution is filtered and residues washed. The residues thus obtained, containing most of the arsenic and only a small amount of the silver, are burned, scorified and cupelled as is customary. The silver in the filtrates is precipitated with salt solution, stirred, allowed to stand over night, and washed. The precipitates are burned, scorified and cupelled as usual. The special point is that the residues and the precipitated silver are run separately. The weights of the silver buttons from the residues are added to those obtained from the precipitation and their total reported.

The metallics are assayed by weighing six to 10 portions of 1-10 A. T. each into 2-in. scorifiers. They are mixed with 15 grams of test lead, two grams of borax glass and silica (equal parts) and covered with 10 grams of test lead. They are then scorified and cupelled in the usual manner.

The final assay is calculated from the assays of the fines and the metallics according to their respective percentages in the ore.

THE CANADIAN ROCKIES.*

In point of area, if not as certainly in point of total volume above sea, the western mountains of North America constitute by far the greatest system of the earth. This vast region has always been very sparsely inhabited. In the orographic features it is generally complicated, often to the uttermost. Its exploration is only well begun. There are thus excellent reasons why the mountain units of this region are so inadequately named and systematized in geographical works, whether issued as official Government reports, as educational text-books, or atlases, or as popular records of travel. Yet, whether he will or no, the explorer responsible for a report on any part of this region must confront the question of names. He returns from his rugged field, to tell of his findings, must use common nouns to indicate what kinds of land-relief he has found, and proper names to aid in individualizing and locating those reliefs in the huge backbone of the continent.

This duty has fallen to the writer in the task of reporting on the geology of the mountains crossed by the 49th parallel boundary between Canada and the United States. Though the same transmontane section has been described by the geologists attached to the 1857-61 commission, though it occurs along the most thickly settled part of British Columbia, and though it is nowhere very far from the lines of two transcontinental railroads, a complete and systematic grouping of the mountains on the boundary was never been made. The difficulty of supplying the lack was felt by the writer in the first of five seasons devoted to the geology of the boundary, but the difficulty was more fully realized as the dire confusion of the nomenclature already in vogue became apparent.

It is manifest that any attempt to develop a constructive view of the boundary mountains should be founded as far as posible upon established units already understood and named. The literature has, therefore, been carefully searched to furnish this required foundation. The result has shown a truly surprising variety of usages in names and in concepts of the topography. The course of compilation inevitably led to the study of the nomenclature of western ranges even far away from the 49th parallel of latitude. Examples of the differences of usage are recorded in the first part of the following paper.

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* Published by permission of the Canadian Commissioner, International Boundary Surveys.

The record may serve in some degree to illustrate the need of a consistent scheme of nomenclature, possibly to suggest partial grounds on which uniformity may some day be established.

The second part of this paper is concerned with a brief account of the nomenclature that seems most appropriate for the ranges crossed by the international boundary.

The search for the variations of nomenclature was made both among authorities responsible on the ground of priority and among authorities influential as standard compilers from original sources. For the present purpose of indicating the lack of uniformity and the confusion into which the great mass of the people may be led by consulting existing works of reference, it is not sufficient to record names found only in Government map or careful scientific monograph. Perhaps more important still in this connection is the record to be made from standard atlases, from school geographies, and from standard influential guide-books. In reality, it has required the examination of but a very limited number of each kind of authoritative works to point the moral. With few exceptions the only works consulted were printed in the English language.

The question of the best general title for the western mountains may be considered as trite by those who do not feel the immediate need of its solution in their professional work. The writer by no means believes it to be trite, as he now completely realizes the wide latitude in naming among the recent influential publications dealing with North American geography. It is scarcely to the credit of our geographical societies and alpine clubs that they will publish at length the statement of one traveller that he found mosquitoes in Newfoundland, of another that his hotel accommodation in Manila was bad, and leave undiscussed the suggestive paper of Prof. Russell and his correspondents on the names of the larger geographical features of North America. There would be no advantage to the European geographers if the Alps masqueraded under a dozen different general titles dependent on the personal tastes of individual writers on those mountains.

(To be continued.)

COBALT SHIPMENTS DURING DECEMBER.

The Canadian Mining Review has been favored with the following detailed statement of Cobalt shipments during the month of December through the courtesy of the Minister of Public Works for the Province of Ontario.

Car No.	Init.	Weight.	Consignor.	Destination.	Date.
27200	G.T.	41,600	Nipissing Mine	New York	December 1.
27475	"	43,100	Nipissing Mine	New York	December 1.
13005	"	62,500	Tretheway Mine	Bergen Junc.	December 1.
5871	"	66,300	La Rose Mine	New York	December 2.
10274	"	60,000	Foster Mine	Bergen Junc.	December 5.
60501	L.V.	60,000	Coniagus Mine	Perth Amboy	December 7.
27082	G.T.	41,380	Nipissing Mine	New York	December 11.
60159	C.V.	60,020	Nipissing Mine	New York	December 11.
23039	G.T.	40,110	Coniagus Mine	Bergen Junc.	December 12.
28017	"	40,120	Nipissing Mine	New York	December 12.
29407	"	40,200	Nipissing Mine	New York	December 13.
26022	"	40,000	Buffalo Mine	Perth Amboy	December 13.
7066	Soo	43,540	Drummond Mine	Copper Cliff	December 13.
1840	N.D.	38,300	Kerr Lake Mine	Copper Cliff	December 13.
36164	C.P.	36,000	Kerr Lake Mine	Copper Cliff	December 13.
21870	G.T.	61,260	Nipissing Mine	New York	December 14.
10931	"	60,080	Nipissing Mine	New York	December 14.
616	C.R. & C.W.	103,530	O'Brien Mine	Copper Cliff	December 14.
21771	G.T.	5,850	Coniagus Mine	Toronto	December 14.
8013	"	60,000	Buffalo Mine	Perth Amboy	December 15.
9879	"	65,000	La Rose Mine	New York	December 15.
9700	"	66,520	Nipissing Mine	New York	December 17.
13960	"	60,830	Nipissing Mine	New York	December 17.
21368	"	56,490	Coniagus Mine	Perth Amboy	December 20.
14141	"	61,110	Nipissing Mine	New York	December 20.
11523	"	60,460	Nipissing Mine	New York	December 20.
14077	"	41,000	La Rose Mine	New York	December 21.
27933	"	46,100	Trethewey Mine	Bergen Junc.	December 21.
13261	"	63,610	Trethewey Mine	Bergen Junc.	December 21.
144182	C.P.	1,000	Silver Queen	Toronto	December 21.
18732	"	42,500	Right of Way Mine	Copper Cliff	December 21.
43862	"	59,000	Right of Way Mine	Copper Cliff	December 21.
6871	G.T.	60,202	Nipissing Mine	New York City	December 22.
26357	"	40,451	Nipissing Mine	New York City	December 22.
12053	"	61,313	Nipissing Mine	New York City	December 22.
39734	C.P.	36,653	Drummond Mine	Copper Cliff	December 22.
56876	"	64,825	O'Brien Mine	Copper Cliff	December 26.
14639	G.T.	60,000	Buffalo Mine	Perth Amboy	December 26.
5849	"	60,000	O'Brien Mine	Bergen Junc.	December 31.

Shipments from Haileybury were nil.

THE WAY OF THE NORTH.

On the first day of the year the merry Cobalters held a dinner at the Cobalt Opera House.

Milton Carr was master of ceremonies and introduced the speaking by proposing toasts to King Edward and President Roosevelt, which were drunk while the appropriate national anthems were rendered. Dr. W. H. Drummond responded for "Our Country," W. H. Linney and C. F. Loring for "Our Guests," H. V. P. Adler and H. H. Lang for "The Mining Industry," and J. W. Osborne for "The Ladies."

After the repast the assembled guests broke into song, one of the contributions being an adaptation of new words to a well known air "The Good Old Summer Time."

A man named La Rose stubbed the end of his toes
On a rock he was blasting one day,
He said, "this is silver, I'll send it to Miller,
And get him to take an assay."
When Miller received it he scarcely believed it,
He cried, "This is surely sublime!"
So the mining commission got out an edition,
Describing Cobalt in its prime.

Chorus:

The good old summer time, the good old summer time,
Strolling up and down the hills, looking for a mine,
Searching for a calcite vein, or any other old sign,
And that's the way we spend our coin in the good old summer time.

THE TRETHEWEY.

There are forty acres in the Trethewey property, but the development work to date has been done entirely on three veins and only about four acres of their holding have been prospected.

Six veins have been uncovered, and one of these, where practically no work has been done, has been traced and uncovered for 400 feet and has high silver values.

The early work at the Trethewey consisted of huge open cuts, and stoping. Stoping has been done on vein No. 1 to the east of the shaft for a distance of 45 feet and a depth of 50 feet.

This stope is about ten feet wide, and from it $250,000 worth of ore has been removed. The distance between the foot and the hanging walls was between five and six feet, and a rich ore body here had a consistent width of from six to eight inches.

Since taking out this vein matter the stope has been widened five feet, as the silver shot wall rock was too valuable to leave in place. It is intended to take out still more of this country rock as it will continue to be profitable.

To the west of the shaft stoping was also done to a depth of twenty-five feet, and the ore from this stope and the open cut about seventy-five feet distant realized about $200,000.

Vein No. 1, on which the shaft has been sunk, and where the above stoping and open-cut are, has been traced for several hundred feet. The shaft has reached a depth of 120 feet and drifting done at the fifty-foot and 100-foot levels.

The east drift at the former level is 160 feet long and to the west a distance has been reached of sixty feet. At the 100-foot level about fifty feet of drifting has been done.

Cross Cut Strikes Coniagas Vein.

At the fifty foot level a cross cut has been started to encounter two veins which have been located about sixty feet away on the surface. One of these is a continuation of the Coniagas vein "A," which runs almost into the corner of the present Trethewey office. The other is within a few feet and nearer the line between the two properties.

Before the cut had been carried twenty feet a blind lead was encountered, and even in the cross-cut a little seam or calcite stringer was discovered, which is a most remarkable occurrence, and makes this part of the property look as if every crack were mineralized.

From the same fifty foot level there will be another cross-cut to the tunnel, from which rich ore was taken to the value of $30,000. At the most, only about one acre has been thoroughly prospected, and to the north of where the above development has taken place there lies 1,000 feet at least, running the width of the location, so that it looks as if there was a long future for the mine.

Daily Assays Are Made.

Systematic daily assays are made of the ore taken out and records kept. The first class ore averages 2,000 oz. of silver to the ton. The second grade ore runs sometimes as high as 1,100 oz., but averages about 250 oz., and the screenings have to date shown the same value as the second grade ore. Even an assay is made of the dump twice a week. So far it has run about 16 oz. per ton.

Ninety men are at present employed, but with the completion of the buildings large additions to the force will be made. At present men are crowded together in the sorting-room. A large ore house and sorting rooms are being built behind the shaft house. When completed a crusher and a sampler will be installed and the ore will be sorted on three tables, each thirty feet long, being washed with warm water as the work is being done.

METALS.

The average price of metals during 1906 was as follows:

Silver—New York, 60,352 cents per oz. fine; London, 27,839 pence per oz., .925 fine.

Copper.—New York, electrolytic, 15.590 cents per lb.; Lake, 15.699 cents per lb.; London, £69.465 per ton of 2,240 lbs.

Tin.—New York, October price; latest quotation obtainable, 42.852c per lb.

Lead.—New York, October price; latest quotation obtainable, 5.750c per lb. London, the London average per ton of 2,240 lbs., was £19.350.

Spelter.—New York, October price, 6.222c per lb. London, £28.075 (Oct. price), per ton of 2,240 lbs.

IS MATTER ELECTRICITY?

Hitherto, that is to say, until the discovery of radium and its marvels, matter was considered as composed of atoms, and atoms, of course, were thought to be the smallest particles of matter. All this is now changed, as we have often pointed out, and the atom itself is now composed of much smaller particles called electrons, or corpuscles.

The corpuscle, we are now told, is in reality nothing but a disembodied electrical charge. A corpuscle contains nothing material. It is electricity. It is nothing else. Instead of speaking of the corpuscle we should speak of the electron. The electron is, then, a disembodied electrical charge, containing no matter, and is the term which will yet be employed to designate this ultimate unit of which all so-called matter is probably composed. And if the electron contains nothing that corresponds to our ordinary conception of matter, and since the same electron can be split off from atoms or from the molecules of all substances, the question naturally arises: Is not all so-called matter of an electrical nature?

This query, set forth by Dr. Harry C. Jones, Professor of Physical Chemistry, is answered boldly by him. There

is a large and increasing mass of evidence, says Professor Jones, warranting the belief that the line separating matter from electricity is on the point of disappearing. Indeed, this conclusion is accepted, at least tentatively, he says, by a considerable number of the leading physicists and physical chemists the world over.

This theory makes the electron—the corpuscle, as some prefer to call it—the ultimate unit of all matter. The atoms are made up of electrons or disembodied electrical charges in rapid motion. The atom of one elementary substance differs from the atom of another elementary substance only in the number and arrangement of electrons contained in it. Thus, we have at last the ultimate unit of matter, of which all forms of matter are composed. The remarkable circumstance is, says Professor Jones, that this ultimate unit of matter—of which all matter is composed—is not matter at all, as we ordinarily understand that term. It is electricity.

It cannot be too strongly insisted upon, Professor Jones is represented in Popular Science Siftings as saying, that matter is a pure hypothesis. What we know in the universe, and all that we know, is change in energy. In order to have something to which we can mentally attach the energy, we have created, in our imagination, matter. Matter, then, is a pure hypothesis. Energy is the only reality. We are accustomed to take exactly the opposite view and to regard matter as the reality and energy as hypothetical. But not only is matter a pure hypothesis, but we have not the least evidence for its existence, as we ordinarily understand the term. And it is interesting to note that Ostwald and Thomson have reached the same conclusion on a point of far-reaching importance in connection with any theory of matter that may finally prevail.

All atoms of whatsoever kind, if all that has preceded be correctly presented, are made up of electrons. Electrons are nothing but negative charges of electricity in rapid motion. In accepting this wonderfully simple and beautiful theory that the nature of all matter is essentially the same, we must not forget, proceeds Professor Jones, that the facts of chemistry and of physics have to be accounted for. We must remember that we have over seventy apparently different forms of matter which cannot be discomposed into anything simpler or into one another, by any agent known to man.

We must, to quote Dr. Jones, also remember that these elements of the chemist have each their definite and distinctive properties, both physical and chemical. They enter into combination with one another in perfectly distinctive ways and form compounds with definite and characteristic properties. In a word, we must remember the almost unlimted facts of chemical science, which are facts, regardless of whatever conception of the ultimate nature of the matter we may hold.

WHAT IS MEANT BY "ARTESIAN."

The significance of the term "artesian" is discussed with great care by Mr. Myron L. Fuller, of the United States Geological Survey in Water-Supply and Irrigation Paper No. 160. While there is considerable diversity of practice there is nevertheless a general tendency to give the term one or other of two meanings, and about fifty geologists throughout the country have expressed their willingness to accept any definition agreed on by the majority of active workers on underground-water problems.

Discussing the original use of the term artesian (as applied to flowing wells first observed in the town of Artois, France), the use of the word in recent scientific literature, in Europe, and the present scientific and popular use of the term in this country, Mr. Fuller makes clear that no definite meaning can be assigned to the word artesian in a publication unless a definition is given in the same paper. It is even found that the same writer employs it differently in the different publications.

The predominant scientific usage of the term is for all wells in which the water rises; in other words, for those exhibiting the hydrostatic or artesian principle. In popular practice it is applied, in addition to the uses previously mentioned, to deep wells in general, especially those in rock, and to a certain extent to any drilled wells yielding water of good sanitary quality.

After discussing the arguments for these various uses, Mr. Fuller gives the following definitions which were agreed on by the members of the Division of Hydrology of the Survey as the most expedient at the present time

Artesian principle.—The artesian principle, which may be considered as identical with what is often known as the hydrostatic principle, is defined as the principle in virtue of which water confined in the materials of the earth's crust tends to rise to the level of the water surface at the highest point from which pressure is transmitted. Gas as an agent in causing the water to rise is expressly excluded from the definition.

Artesian pressure.—Artesian pressure is defined as the pressure exhibited by water confined in the earth's crust at a level lower than its static head.

Artesian water.—Artesian water is defined as that portion of the underground water which is under artesian pressure and will rise if encountered by a well or other passage affording an outlet.

Artesian system.—An artesian system is any combination of geologic structures, such as basins, planes, joints, faults etc., in which waters are confined under artesian pressure.

Artesian basin.—An artesian basin is defined as a basin of porous bedded rock in which, as a result of the synclinal structure the water is confined under artesian pressure.

Artesian slope.—An artesian slope is defined as a monoclinal slope of bedded rocks in which water is confined beneath relatively impervious covers owing to the obstruction to its downward passage by the pinching out of the porous beds, by their change from a pervious to an impervious character, by internal friction, or by dikes or other obstructions.

Artesian area.—An artesian area is an area underlain by water under artesian pressure

Artesian well.—An artesian well is any well in which the water rises under artesian pressure when encountered.

Mr. Francis F. Coleman, formerly with the Westinghouse and Allis-Chalmers companies and recently with the Traylor Engineering Co., has joined the Lidgerwood Mfg. Co., as publicity manager. Mr. Coleman takes to the service of the Lidgerwood Mfg. Co. not only a large amount of experience gained in the service of the companies mentioned but an interesting literary style acquired during many years of experience on the New York Sun and other metropolitan newspapers. Mr. Coleman was for a time the editor of the Electrical Age before the late Louis Cassier bought that publication. While with the Westinghouse Company he wrote the catalogue of the Westinghouse Steam Turbine. During his engagement with the Allis-Chalmers Company he designed and edited the new series of catalogues and bulletins which that company issues and wrote the two admirable special publications issued by the company in 1904-5, "The Book of the Four Powers" and "The Power of the Subway." During the existence of the Louisiana Purchase Exposition at St. Louis, Mr. Coleman was in charge of the three large exhibits there of the Allis-Chalmers Company, making his headquarters at the "Big Engine" in Machinery Hall. He was the organizer and first vice-president of the Machinery Club and was active in bringing about the organization of the United Exhibitors' Association at the fair. He is a member of the Technical Exhibitors' Association. Mr. Coleman's headquarters are at the main office of the Lidgerwood Mfg. Co., 96 Liberty street, New York, where he will be pleased to receive visits from both business office and editorial representatives of the trade and technical periodicals.

COPPER STATISTICS.

Messrs. James Lewis & Son say in their December report on copper:

"In the United States the scarcity of railroad cars in Montana and a flood in Arizona delays deliveries and the quotation for Lake has advanced ½ cent per lb. and is now 23 to 23¼ cents, or £106 to £107 3s. per ton.

"Our statistics show that the consumption of England during the past eleven months has been only 248 tons more than the average of the same period during the two previous years, while the export of manufactured copper and sulphate is 11,090 tons less. The consumption of France has increased 4,512 tons, and that of foreign copper in Italy, Austria and Russia has decreased 6,530 tons, but in Germany the increase in ten months has been 16,364 tons. The total increased consumption of foreign copper in Europe and of manufactured copper exported from England, is, therefore, only 3,504 tons so far this year, as compared with the average of the same period in 1904 and 1905.

"The United States Geological Survey publishes the following statistics for the year 1905:—

	Tons.
Total domestic production	402,637
Imports	94,073
Exports	246,708
Consumption	259,378

"The increase in the production for 1906 is estimated at about 31,250 tons. Imports will show an increase of approximately 10,000 tons, and exports a decrease of 32,000 tons, making the consumption nearly 333,000 tons —an increase of 28½ per cent. over 1905—assuming there is no change in the stock.

"Stocks in England and France and the 'visible supply' show a considerable increase—840 and 815 tons respectively. The former are now 50 per cent. larger than on the 1st January, when the price of Standard was 35 per cent. lower."

THE COBALT DISTRICT*.

If the visitor to Cobalt expects to find a mining camp, the streets of which are lined with gambling places, dance halls, and saloons, with rough characters carrying belts filled with cartridges, revolvers, and all the accessories of the early Western mining camps, he will be greatly disappointed. It is true that when the discoveries were first made in Cobalt, a few individuals appeared equipped to uphold their rights by the "law of the six-shooters," but in less than a week armament of all kinds disappeared, and the camp took on the orderly, quiet and law-respecting attitude it has ever since maintained. If gambling and drinking exist at all to-day they do so behind closed doors, and the visitor sees nothing to cause him to change his opinion with regard to the orderliness of the district.

The hotels furnish meeting places for all, and deals for property, passed claims, etc., are put through in the quietest manner.

When one remembers that previous to February, 1906, there were no buildings except a few log cabins, the rest of the people living in tents, he is naturally surprised to step from a Pullman car and register at a hotel, heated by steam and lighted by acetylene gas. In the hotels the beaver coat of the capitalist rubs against the "mackinaw" of the prospector and the moccasins and coonskin coat seen so frequently may belong to the man who has sold a claim for a fabulous price.

In all mining camps there exists a varied assemblage of men always searching for the precious metals, and Cobalt is no exception. Mining men from Rossland, Alaska, South Africa, New Zealand, Colorado, Utah, Nevada, California, and every section of the world are there either on their own behalf or in the interests of capitalists. When the rush first started store-keepers, farmers, business men and professional prospectors hurried to the scene and claims were soon staked and applied for. Then began squabbles and litigation over claims, some of which have not been settled to this day. The case concerning the Lawson controversy is very interesting, and will be described in a future issue of the Journal.

*From the Engineering and Mining Journal.

First Mineral Discovery.

The discovery of mineral wealth was primarily due to the advance of the railroad through the country. There seems to be a discrepancy with regard to the first discovery. The McKinley-Darragh people claim that the men laying ties discovered silver in the swamp adjoining the railroad, and on their present property, while others maintain that La Rose, a blacksmith employed by the railway, discovered the precious metal and filed the first claim. La Rose is one of the owners of the famous La Rose Mine, for which, it is rumored, $10,000,000 has been offered and refused.

In other camps the miners are offered every opportunity to spend their hard-earned wages. In Cobalt the men live at the camps, and there is comparatively little opportunity to spend their money. It is the rule for companies to furnish board and lodging in comfortable quarters, and the wages paid include living expenses. The food at the camps is exceedingly good and in abundance. Wages range from $1.75 to $3.50 per day, depending upon the kind of work. Under these conditions the men fare very well. There is always a good demand for men owing to increasing development work in all the mines.

Possibilities of Claims.

The district as a whole is probably the most peculiar ever brought to the notice of mining engineers, investors, and the public. All claims have their element of interest, because, while there may be only enough showing of valuable mineral to warrant passing by the inspector, still no man can state, because of the peculiar conditions existing in this country, that there will be none at depth. This gives the "wild-cat' promoter a chance of which he has promptly availed himself, and the man who may have paid $1,500 for his 20 or 40 acres, will calmly ask from $50,000 to $100,000 for it, and in many cases such prices were paid. The loss or profit to the buyer can only be decided by time and development.

The occurrence of the veins in Coleman township has been likened to the cracks on a dry mud flat. While the general trend seems to be northeast and southwest, still there are strikes having a north-south and also an east-west direction. Veins are liable to swell and pinch, twist and turn, and it is doubtful if there are many in the camp which have shown any marked continuity.

A vein existing strongly in one property may or may not continue in the adjoining claim, as is seen on the Lawson Lot. Here the vein shows up right to the surface at a width of from 6 to 12 in., but when it reaches the Silver Leaf boundary the vein branches out into stringers. To the south it pinches out, and fails to enter the Silver Nugget property so far as is known. And so it is too uncertain for anyone to try to predict or to lay down any rules for the district. Geologists have advanced theories only to have them upset in a short time.

The salvation of the camp is that rich mineral deposits are found in every direction. When we stop to consider that two men with practically no equipment, can work a vein no wider than 0.5 in., and realize more for their labor than they could at any trade, we can obtain some idea of the wealth contained in a vein from 4 to 12 in, in width. It is not uncommon to see rock running as high as 15,000 oz. of silver per ton, but, of course, this is by no means the run of the camp.

Production of the Camp.

A glance at the figures obtained by the Bureau of Mines of Ontario will give a more accurate idea of the actual wealth. In 1904 only 158 tons were shipped from the district. This shipment realized $136,217 or $862 per

ton. The following year returns show 2,144 tons, valued at $1,473,196, or $691 per ton. During the present year (1906) there have been shipped, from Jan. 1 to Sept. 30, 2,305 tons, the value of which was $1,750,000. For October and November no values are available, but the tonnage is a matter of record. During these two months 1,864 tons were shipped to the smelters, and estimating their value according to existing data, we would find that the total shipments from the beginning of the camp to Nov. 30, 1906, amounted to 6,453 tons, valued at $4,700,000, or $729 per ton. This average price includes all ore shipped and does not show the high values of the first-grade ore.

The Nipissing Mines.

During the present time rumor is busy and one hears surprising reports from all quarters. The Nipissing Mine has been made the subject of more rumor than probably any other mine in the district. Since the announcement was made that the Guggenheims had decided to throw over their option reports were circulated that the mine had decreased in value owing to the pinching out of vein No. 49, that this vein had changed into antimony, that in sinking, slate had been encountered, that only thirty men were working on the property, that the title was to be revoked, and that a new attack was to be made on certain claims held by the Nipissing Company. These rumors were circulated by people who either knew nothing of the actual conditions existing at the mine or else were maliciously endeavoring to depress the stock. That this result was accomplished is evident to all. There is no doubt, whatever, that the mine, so far as has been shown, is in a healthy condition, and that values are apparent even to the lay mind. An inspection of the property, during the week ending Dec. 15, showed active mining operations and veins of great richness.

Vein 49, the vein that has been chiefly talked about, has been stripped for a distance of 110 ft., and broken down by underhand stoping to a depth of approximately 25 ft. The work has been done in three steps, and that valuable ore exists is apparent even without assay results. The vein is almost solid argentite, containing native silver and calcite, and the wall rocks contain a workable amount of leaf silver. The width of the vein appears to vary from about 20 in. to 48 in. At the bottom there was exposed a little decomposed calcite, but that the vein has changed materially in character, width or value may be emphatically denied.

There are from 175 to 180 men employed on the property, 75 of whom are on underground operations. A more detailed description of the property will be given in a subsequent issue.

HASTINGS (B.C.) EXPLORATION SYNDICATE, LIMITED.

DIRECTORS' REPORT.

The Directors beg to submit the eighth statement of accounts and balance sheet for the year ended 31st May, 1906. Shareholders will find in the Manager's advices an explanation of the short delay which has occurred on this occasion in the issue of the annual report.

The financial condition of the Company shows—Cash on hand at Bankers, London and Nelson, British Columbia, £3,032 7s. 7d. The administration expenses for the year, in London and British Columbia are substantially the same as those for the previous twelve months, but the cost of development work at the mines during the same period has increased to the extent of £777 17s. 1d., and this was incurred on the Arlington Group.

The ore shipped to the smelters during the year under review realized £10,070 5s. 8d. net, this compares with £10,099 16s. net in 1905. The returns show an increased output, but owing to the lower grade of ore, the average value was nearly $5 per ton less than that for the preceding year, otherwise the result would have been more advantageous.

From the carefully compiled statements furnished by Mr. Leslie Hill, the Company's local manager and consulting engineer in British Columbia, your Directors have extracted the following from the advices of 23rd of August, which they consider will be interesting to Shareholders:—

"Arlington Mine—

"During the year 1,470 feet of development work was done at the Arlington Mine, consisting of drifts 929 feet, crosscuts 47 feet, winzes 44 feet, and raises 450 feet. Of this work 369 feet was done on the 770-foot north level, 14 feet on the 500-foot north level, 101 feet on the head Arlington adit, and 986 feet on the No. 2 Prospect adit. The total cost of this development work was $8,700.37, or an average cost of $5.98 per foot.

"The 770-foot north level was continued for 224 feet, and the No. 2 Prospect adit was driven 428 feet, and these levels were connected by two raises. The vein between the No. 2 Prospect adit and the 770-foot north level formed a sag or roll, and an intermediate level was driven from the second upraise 113 feet north and 88 feet south. The shoots of ore found on the 770-foot north level continue to the intermediate level, and are from 2 to 6 inches thick, and occasionally thicker. In the south intermediate level the porphyry in the vein is distorted and irregular, and the ore is uncertain. The north intermediate drift looked very promising, but the ore became broken up and irregular. It has now widened out and become more solid and regular, there being two seams of ore,—that next the hanging wall being about 18 inches, and that next the porphyry about 30 inches thick.

"Some small seams of ore were met with in the No. 2 Prospect adit, but crosscutting on these failed to disclose any shoots of ore which can be stoped.

"The head Arlington level was driven 62 feet, and crosscuts aggregating 39 feet were driven. The vein is entirely cut off by the fault-plane, and all the ore disclosed has been stoped out.

"The track from the head Arlington adit has been taken up and relaid in the old 365-foot level. Some high grade ore was left in the workings on this level, and I propose to follow this up and take out all ore which will pay for stoping.

"A new ore-bin was built at the No. 2 Prospect adit, and is now being used. An ore bin of three bents and with a capacity of 60 tons was built, together with a high trestle for dumping the waste. The cribbing was built with a view to enlarging the ore-bin, and four more bents will be added this season, making the total capacity about 140 tons. All the ore below the 770-foot level will be brought to this ore-bin.

"The ore shipped during the year was stoped chiefly from the ground below, or to the west of the 770-foot north level. Some ore which had been left in the upper workings was also followed up and stoped out, and now practically all the ore above the 770-foot level is stoped out.

"During the year 1,231.94 tons of ore were shipped to the Hall Mining and Smelting Company, at Nelson, which yielded net smelter returns amounting to $52,352.90, and also a lead bounty amounting to $382.43, was paid by the Government, making the total receipts $52,735.33, or $42.81 per ton. The average value of the ore sent to the smelter was $4.94 per ton less than the average value of the ore shipped during the previous year.

"The cost per ton of ore shipped was as follows:—

Development	$7.14
Stoping	11.08
Sorting and Tramming	4.56
Timbering	.14
Supplies	2.61
General Expenses	2.34
	$27.87

Read at the Ninth Ordinary General Meeting, Dashwood House, London, E.C., Jan. 7, 1907.

"1,370 mine-cars of ore were taken out and 12,327 mine-cars of waste were put on the waste-dump; adding the waste broken and used to fill up the stopes, the average would be 10 tons of waste to one ton of ore, which would make the average cost of the rock mined $2.53 per ton.

"The 770-foot north level has been driven to within a short distance of the boundary line of the Arlington claim. The No. 2 Prospect adit is in the 'Directorate' mineral claim, but if the ore continues it will be advisable to drive the 770-foot north level into and through the ground of the 'Canadian King' mineral claim, and to connect these levels in order to secure a supply of air. For this purpose I have obtained a lease of the latter claim for two years from the 1st of July, 1906, at a royalty of 10 per cent., direct from the 'Canadian King' Consolidated Mining Co.

"The ore body on the north intermediate drift has not been developed sufficiently to form an estimate of the amount of ore exposed, but if it continues to develop in length and width, and of equal thickness, the supply of ore for the coming winter is assured."

In a later letter Mr. Hill advises that the foreman at the mine had informed him the ore was still holding its own, and if anything improving, and says:—

"I delayed sending you the annual report in order to be able to give fuller information in regard to the ore in the north intermediate drift, as the shipments this year will depend principally upon the development of this shoot."

Nothing has been done during the year on any other of the mineral properties owned by the Company, but renewed activity is reported at the "North Star" mine, and there are rumors of a valuable discovery on the "Stemwinder" claim, both of which are adjacent to the Company's properties in the East Kootenay District, and any discoveries made by them are likely favorably to affect this Company's holdings there.

Blairmore Coal Lands.

The payment of the second instalment of the purchase price of these properties, due to the Dominion Government of Canada, has been completed, and all interest paid up to the 1st April, 1906; these absorbed £915 of the Company's funds. It will be necessary to provide a sum of about £1,300 for the third instalment, due in June, 1907, and a like amount for the final payment in 1908.

No satisfactory offers have been received for the properties, but your Directors are taking further steps toward negotiations, which they trust will lead to a satisfactory result.

In accordance with Clause 69 of the Articles of Association, Mr. G. L. Whately retires by rotation from the Board, and being eligible, offers himself for re-election as a Director.

By order of the Board,

E. HOLT,
Secretary.

163-4, Dashwood House,
New Broad Street,
London, E.C.

29th October, 1906.

Balance Sheet, 31st May, 1906.

Capital and Liabilities.

	£ s. d.	£ s. d.
Capital Account—		
Nominal	£100,000 0 0	
(100,000 shares of £1 each)		
Issued—		
60,375 shares of £1 each, fully called up ...		60,375 0 0
Sundry creditors in British Columbia		780 18 11
Carried forward		£61,155 18 11

Assets and Expenditure.

	£ s. d.	£ s. d.
Purchase Account		3,500 0 0
Property Account—		
Mining Claims at East and West Kootenay, as per last Balance Sheet		10,481 6 3
Blairmore Coal Lands (expenditure in respect of interest in)		5,103 6 2
Plant, Machinery, Buildings, Live and Dead Stock		9,623 2 5
Sundry Debtors — British Columbia		278 1 7
Cash at Bank, London (Current Account)	319 3 1	
Cash at Bank, British Columbia (Deposit Account).	2,191 12 4	
Cash at Bank, British Columbia (Current Account)	517 17 2	
Cash in hand, London	3 15 0	
		3,032 7 7
Expenditure—		
Balance brought forward from last Balance Sheet, 31st May, 1905	23,338 16 5	
Expenditure (London) from 1st June, 1905, to 31st May, 1906 and (British Columbia) from 1st May, 1905, to 30th April, 1906:		
London Office Expenses ...	350 0 0	
Directors' Fees as voted ...	500 0 0	
Audit Fee, 1905 (London) ..	36 15 0	
Petty Cash, Stationery, Cablegrams and Legal Expenses (London)	69 7 2	
Income Tax	30 0 0	
Insurance, Accident and Fire (British Columbia)	160 10 2	
Government Ore Tax (British Columbia)	184 9 9	
Salaries in British Columbia and Nelson Office Expenses	1,571 10 7	
General Expenses (British Columbia) including £300 Bonus to Employees	285 3 9	
Development Expenses—		
Fort Steele Claims	15 17 0	
Arlington Group	6,575 9 7	
Head Arlington	148 14 2	
	33,266 13 7	
Deduct—Interest	96 3 0	
	33,170 10 7	
Less Bullion Account, proceeds of Ore shipped to Smelters. . . .10,622 19 8		
Deduct Expenses. . . . 664 5 8		
	9,958 14 0	
Lead Bounty. . 111 11 8		
	10,070 5 8	
		23,100 4 11
Dividend of 1s. per Share on 60,375 Shares (March, 1902)	3,018 15 0	
Do., (March, 1905).....	3,018 15 0	
		6,037 10 0
		£61,155 18 11

JAS. HEAD, Chairman.
E. HOLT, Secretary.

Auditors' Certificate.

In accordance with the provisions of the Companies' Act, 1900, we certify that all our requirements as auditors have been complied with.

TINGLE, COMBER & Co.,
Chartered Accountants.

To the shareholders of the Hastings (British Columbia) Exploration Syndicate, Ltd.

Auditors' Report.

We have audited the above balance sheet, and, in our opinion, such balance sheet is properly drawn up so as to exhibit a true and correct view of the company's affairs, as shown by the books of the company.

TINGLE, COMBER & Co.,
Chartered Accountants.

110, Cannon street, London, E.C.,
23rd October, 1906.

GERMAN CONSUMPTION OF COPPER.

Mesrs. L. Vogelstein & Co., 90-96 Wall street, New York, write: We herewith beg to give you the figures of German consumption of foreign copper for the months January to October, 1906, as compared with 1905: — Imports during October, 11,321 tons; exports during October, 946 tons; consumption, 10,375 tons. Imports of copper January to September, 99,230 tons; do. October 11,321 tons. Total 110,551 tons. Exports of copper January to September, 7,890 tons; do. October, 946 tons; total, 8,836 tons. Consumption of copper January to October, 1906, 101,715 tons; do. to October, 1905, 82, 215 tons. Out of the above 9,623 tons of copper were imported from the United States during the month of October.

THE MINING SHARE MARKET.

Messrs. Robert Meredith & Co., 57 St. Francois Xavier street, Montreal, have sent out a circular letter to their clients that contains some most timely information. They say:—

The Cobalt boom has undoubtedly been the most striking feature of the past year, centering on the remarkable advance and as remarkable decline in the price of Nipissing stock. The output of Cobalt for the year has been $2,400,000, and the total capitalization of the Cobalt companies is $250,000,000. The mineralized area, which at the beginning of the year was believed to be only about five square miles in extent, has now been proved to be nearly 100 miles square, and a great deal of development has been done with very good results, particularly in the case of certain privately owned properties, such as the Drummond, La Rose, Jacobs, Hudson Bay, Coniagas, University, etc.

We have advised, and still recommend, great caution and conservatism in dealing in Cobalt stocks. The old mining stock rule, that money paid for Treasury stock should go into the mine, and that not more than fifty per cent. of the total stock issue should go into promoters' hands does not seem to apply to many Cobalt propositions. At the same time, at current prices, some of the Cobalt stocks appear very attractive. The prices, dividends and yields of the principal Cobalt dividend payers are as follows:—

Name.	Capitalization.	Par Share.	Market Value.	Dividend.	Yield.
Nipissing	$6,000,000	$5.00	$14.00	20 p.c.	7.14 p.c.
Trethewey	1,000,000	1.00	1.85	16	9.22
Silver Queen	1,500,000	1.00	1.95	20	10.26
Foster Cobalt	1,000,000	1.00	2.25	8	3.00

Interesting possibilities.

Green Meehan	1.40
Kerr Lake	5.25
Peterson Lake	.48
Red Rock	1.20
Right of Way	7.00
Silver Leaf	.18½
McKinley-Darragh-Savage	1.75

BRITISH COLUMBIA.

The formation of the Consolidated Mining and Smelting Company has put the Rossland Camp on its feet, and the continued prosperity of this mining district seems now assured. The high prices of copper and silver have made all the working mines in British Columbia highly prosperous this year, and Granby, Dominion Copper and B. C. Copper, and a number of smaller properties, have done well. We recommend purchases of Consolidated Mines, Canadian Gold Fields, Dominion and B. C. Copper as investments. The current prices, dividends and earning power of the dividend paying B. C. stocks are as folows:

Name.	Capitalization.	Par Share.	Market Value.	Dividend.	Yield.
Consol. Mines.	$4,698,800	$100	$145	10 p.c.	7 p.c.
Can. Gold Fields.	600,000	.10	.08	7	8.75
Granby	13,363,030	100	135	12	8.89
Domin. Copper	5,000,000	10	7		
B. C. Copper.	2,000,000	10	14		

Canadian Gold Fields is a very attractive stock to small investors. Its dividends are paid from the dividends on its holding of the Consolidated Mines, and its large holding of mineral lands gives it good speculative possibilities. The total production of gold, silver, lead and copper from British Columbia during the year has been $26,000,000, an output that a few years ago would have been regarded as phenomenal.

There has been a renewal of interest in a number of the lower priced B. C. stocks, the demand coming mainly from the West. We look for a decided movement during the present year, and consider the following as being the most attractive:—

	Capitalization.	Par Value.	Market Price.	Value at M'k. Price.
California	$2,500,000	$1.00	.5½c.	$126,250
Monte Cristo	2,500,000	1.00	.2½c.	62,500
Virginia	500,000	1.00	.7½c.	375,000
Novelty	150,000	.10	.3c.	45,000
Ramb'r-Cariboo	1,000,000	1.00	.29c.	290,000

WESTERN COAL.

Several of the Western Coal Companies have come prominently to the front. The stock of the International Coal Company has doubled in value, and a dividend of 1 per cent. a quarter has been declared. A good deal of interest is also taken in Diamond Vale and Alberta Coal and Coke, and we feel inclined to advise purchasers of these stocks, particularly regarding the following:—

	Capital.	Par Value.	Market. Price.	Divi- dend.	Yield.
International Coal.	$3,000,000	$1.00	.66	4 p.c.	5.93 p.c.
Diamond Vale.	3,000,000	1.00	.30		
Alberta	3,500,000	1.00	.27½		

THE CHIBOUGAMAU.

During the year 1906, 200 prospectors made their way into the new Lake Chibougamau Mining District, north of Lake St. John, in the Province of Quebec, and new finds of rich gold, silver and copper ores have been made. The formation of the country, which has been gone into pretty thoroughly, seems to be one, that encourages the belief, that there is a large mineralized area and that quantities of rich minerals, in trace fissure veins, will be discovered. A quartz vein that has been proved to be 1,100 feet in length, from 40 to 80 feet in width, and which at a depth of 34 feet over the whole area of the bottom of the shaft, goes $24 to the ton in fine gold, and 15 p.c. copper, has been opened up on Paint Island, and, together with a large deposit of very fine asbestos in the vicinity, is now the property of the Chibugamoo Gold and Asbestos Mining Company, a close corporation, with a capital stock of $6,000,000. Some other very rich strikes have been made in this district, and assays of $24.00 and of $28.00 to the ton from hand samples of ore, brought from this country, have been obtained. It is confidently expected that before

Parliament adjourns, subsidies that will ensure the building of a railway into this district will be granted. In all our long experience we have never known a more favorable outlook for the future than seems to be presented by these mineral discoveries, and we advise that due attention be given to legitimate mining propositions based upon them.

Yours truly,
R. MEREDITH & CO.

COBALT COMPANIES.

The Toronto Globe of January 3 contained a tabulated statement of all the Cobalt companies incorporated up to the close of 1906. In its introductory discussion of the subject the Globe said:—

Cobalt capitalized arrays itself in ciphers which almost defy comprehension. To talk of Cobalt capitalized is to talk of millions. Ontario has granted incorporation up to date to companies bearing an aggregate capitalization of $171,148,000. Some of the best of the properties represented have been sold to the public at prices double or treble their capitalization. New York, Maine, Arizona and New Jersey have organized and are exploiting mining and exploration companies, and they all talk in millions. The market at present calls upon Cobalt to give returns on an estimated aggregate of $250,000,000. Some of the companies originally incorporated on a modest basis have altered their figures from hundreds of thousands to millions, and the tendency always is towards inflated figures. People who have studied Cobalt at all carefully admit that the potentialities of the camp are great. It has been pronounced by disinterested expert mining men as the greatest silver camp on the globe. It is the great value of the silver deposits there that constitutes the greatest danger for the unthinking public. The exploiting of "wild cat" companies is a consequence. In the matter of investment the Canadian public must be its own best judge.

Some mining companies operating in Ontario under State incorporation have not complied with the Provincial requirements in taking out a license to do business here. Some of these companies assert that they are not legally required to do so, and the Provincial Secretary's Department is now giving the question of the standing of these alien combinations consideration that foreshadows the adoption of some course of action at an early date.

Companies Incorporated in 1903.

Temiskaming & Hudson's Bay Mining Co., Limited, New Liskeard	$ 25,000

Companies Incorporated in 1904.

Montreal & Boston Consolidated Mining & Smelting Co., Limited, Toronto	7,500,000
Nipissing Mining Company, Limited, Toronto.	250,000
Silver King Gold and Copper Co., Limited, Toronto.	2,000,000
Syndicate Mining, Limited, Toronto	50,000

Companies Incorporated in 1905.

Annie Mining Company, Limited, Toronto	40,000
Annabella Mining Company, Limited, Toronto..	40,000
Buffalo Mining Company, Limited, Fort Erie..	50,000
Blanche River Mining Company, Limited, New Liskeard	40,000
Coleman Development Company, Limited, Haileybury	300,000
Chester Silver Mining Company, Limited, New Liskeard	25,000
Cobalt Development Company, Limited, Toronto.	1,000,000
Cobalt Canadian Mining & Milling Co., Kingsville	500,000
Cobalt Merchants' Mining Company, Limited, Toronto	200,000
Coleman and Bucke Consolidated Cobalt Silver Mining Company, Limited, Ottawa	1,000,000
Coleman Cobalt Mining Company, Limited, Toronto	250,000
Dymond & Abitibi Mining & Development Co., Limited, New Liskeard	25,000
Dymond Development Co., Limited, Ottawa.	250,000
Gordon-Cobalt Silver Mining Co., Limited, Toronto	200,000
Imperial Silver Mining Company of New Liskeard, Limited, New Liskeard	250,000
Isa Mining Company, Limited, Toronto	40,000
Kerr Lake Mining Co., Limited, Toronto	40,000
Louise Mining Co., Limited, Toronto	40,000
McCormack Cobalt Silver Mining Co., of Toronto, Limited, Toronto	500,000
Mac Mining Co., Limited, Toronto	350,000
Margaret Mining Co., Limited, Toronto	40,000
New Liskeard & Northern Ontario Mining & Development Co., Limited, New Liskeard.	25,000
New Ontario Ore Refining Company, Limited, Toronto	500,000
New Ontario, Cobalt & Silver Mining Co., Limited, Ottawa	1,000,000
Northern Exploration Co., Limited, Haileybury.	100,000
Ontario Cobalt Developing Co., Limited, Toronto.	350,000
Pittsburg Cobalt Co., Limited, Toronto	75,000
Rothschild Cobalt Co., Limited, Haileybury	500,000
Silver Five Mining Co., Limited, New Liskeard.	40,000
Sovereign Cobalt Mining Co., Limited, Toronto.	200,000
Silver Bar Mining Co., Limited, Ottawa	500,000
Savage Cobalt Silver Mining Co., Limited, Toronto.	250,000
Standard Silver & Cobalt Mining Co., Limited, New Liskeard	40,000
Sliver Hill Mining Co., Limited, Mattawa	50,000
Silver Gulch Mining & Prospecting Co., Cobalt.	75,000
Terrill Cobalt Mining Co., Limited, Sault Ste. Marie	100,000
Temiskaming Mining Co., Limited, Haileybury.	100,000
Temagami Mining & Milling Co., Limited, Toronto	40,000
Temiskaming Brokerage Co., Limited, New Liskeard.	10,000
Temiskamingue Reduction Works, Limited, Cobalt.	166,000
Toronto Cobalt Mining Co., Limited, Toronto..	300,000
Windsor & Cobalt Mining Co., Limited, Windsor	150,000
Wendigo Progressive Mining & Development Co., Limited, New Liskeard	40,000

Companies Incorporated in 1906.

Abitibi Mining & Development Co., Limited, Finch	100,000
Abitibi & Cobalt Mining Co., Limited, Sault Ste. Marie, Mich.	2,500,000
Argentile Mining & Smelting Co., Limited, Toronto.	1,000,000
Albert Mining Co., Limited, Toronto.	375,000
American Silver King Mining Co., Limited, Haileybury	500,000
Amalgamated Cobalt Mines, Limited, Toronto..	1,000,000
Buffalo Mines, Limited, Toronto	1,000,000
Beaver Silver Cobalt Mining Co., Limited, New Liskeard	500,000
B. B. Harlan & Co., Limited, Toronto	40,000
Boston Mines, Limited, Toronto	50,000
British American Silver Co., Limited, Toronto..	50,000
Bailey Mining Co., Limited, Windsor	500,000
Canadian Cobalt & Silver Mining Co., Limited, Ottawa	250,000
Crown Mining Co., Limited, Leamington	1,000,000
Croesus Mining Co., Limited, Ottawa	500,000
Clark's Standard Developing Co., Limited, New Liskeard	40,000
Cobalt Silver Queen & Copper Mining Co., Limited, Sault Ste. Marie	500,000
Cobalt-North Ontario Mining Co., Limited, Haileybury	40,000

Cobalt Consolidated Mines, Cobalt 2,500,000
Cobalt Open Call Mining Exchange, Limited, Cobalt 40,000
Cobalt Townsite Mining Co., Limited, North Bay 100,000
Cobalt Silver Queen, Limited, Cobalt..... 1,500,000
Cross Lake Consolidated Mining & Milling Co., Limited, Toronto 1,000,000
Cobalt Chartered Co., Limited, Haileybury 350,000
Cobalt & Hudson Bay Development Co., Limited, Haileybury 100,000
Cobalt Standard Mining Exchange, Limited, Cobalt 40,000
Columbus Cobalt Silver Co., Limited, Toronto.. 450,000
Cobalt Smelting & Refining Co., Limited, Toronto 250,000
Cobalt Nugget Silver, Limited, Haileybury 40,000
Cobalt Central Silver Mining Co., Limited, New Liskeard 500,000
Clear Lake Mining Co., Limited, Toronto..... 650,000
Cobalt Diamond Drilling & Development Co., Limited, Toronto 50,000
Canada Mines, Limited, Toronto 100,000
Canada Minerals, Limited, Toronto 100,000
City of Cobalt Mining Co., Limited, Cobalt..... 500,000
Cleveland Cobalt Silver Mines, Limited, Toronto 1,000,000
Colonial Mining Co., Limited, Cobalt..... 100,000
Cobalt Diamond Drilling & Development Co., Limited, Toronto 50,000
Dwyer Mining Co., Limited, Toronto 100,000
Detroit & Cobalt Development Co., Limited, Windsor 25,000
Dominion Cobalt Mining & Developing Co., Limited, Cobalt. 450,000
Detroit & Algoma Silver Mining Co., Limited, Windsor 100,000
Eureka Silver Mining Co., Limited, New Liskeard 100,000
Erie Cobalt Silver Mining Co., Limited, Toronto. 1,000,000
Foster Cobalt Mining Co., Limited, Toronto.... 1,000,000
Florence Mining Co., Limited, Toronto 100,000
Findlay Mining Co., Limited, Windsor..... 20,000
Gillies Silver Mining Co., Limited, Haileybury.. 500,000
Green Silver Mining Co., Limited, Haileybury.. 500,000
Green Silver Mines Co., Limited, Toronto 300,000
Green Rock Mining Co., Limited, Sault Ste. Marie 600,000
Gilpin Silver Cobalt Mining Co., Limited, Toronto 500,000
Giant Silver Nugget Mines, Limited, Haileybury. 1,000,000
German-Canadian Smelting & Refining Co., Limited, Toronto 1,000,000
Gordon Benson Cobalt Mining Co., Limited, Sarnia 300,000
Golden Park Mining Company, Limited, Windsor 100,000
Hudson Bay Extended, Limited, Toronto 50,000
Hudson Cobalt Mining Company, Limited, Barrie 300,000
Huronian Cobalt Silver Mining Company, Limited, Cobalt 500,000
Heathcock Mining Company, Limited, Dresden. 100,000
Iroquois Cobalt Silver Mining Co., Limited, Haileybury 100,000
Interprovincial Mining Co., Limited, Haileybury. 1,500,000
International Cobalt and Silver Mining Co., Limited, Sault Ste. Marie 500,000
Jessie Fraser Copper Mining Co., Limited, Niagara Falls, Ont. 250,000
King Cobalt Mining Co., Limited, Toronto.... 300,000
Long Lake Co., Limited, Cobalt..... 100,000
Lawson Cobalt Silver Mining Co., Limited, Eganville 500,000
Larder Lake Gold Mining Co., Limited, Haileybury 500,000
McConnell and Prospectors' Exploration Co., Limited, Ottawa 200,000
Montreal Cobalt Mining Co., Limited, Toronto.. 100,000
Mining and Lands Development Co., Limited, Toronto 40,000
McKinley-Darragh-Savage Mines of Cobalt, Limited, Toronto 2,500,000
Montreal River Silver Syndicate, Limited, Toronto 200,000
Mining Development and Securities Co., Limited, Toronto 150,000
York and Canadian Mining Co., Limited, Toronto 40,000
Northern American Cobalt Refining Co.,, Limited, Hamilton 1,000,000
Norwalk Refining Co., Limited, Sault Ste. Marie 300,000
North Cobalt Land Corporation, Limited, Toronto 40,000
North Ontario Reduction and Refining Co., Limited, Toronto 500,000
National Mining and Developing Co., Limited, New Liskeard 40,000
Nancy Helen Mines, Limited, Cobalt 500,000
Ohio Cobalt Mining Co., Limited, Toronto..... 500,000
Ottawa Cobalt and Silver Mining Co., Limited, Ottawa 250,000
Peterson Lake Silver Cobalt Mining Company, Limited, Toronto 3,000,000
Progress Cobalt Silver Mining Co., Limited, Cobalt 500,000
Queen City Mining and Developing Co., Limited, Toronto 150,000
Red Rock Silver Mining Co., Limited, Haileybury 1,000,000
Right of Way Mining Co., Limited, Ottawa 500,000
Rochester Mining Co., Limited, Toronto..... 40,000
Silver Leaf Mining Co., Limited, Toronto 5,000,000
Silver Star Mining Co., Limited, New Liskeard. 40,000
Savage Mine of Cobalt, Limited, Toronto 500,000
Silverland Development Co., Limited, Toronto.. 1,000,000
Sterling Silver Cobalt Mining Co., Limited, Toronto 600,000
Silver City Mining Co., Limited, Toronto 350,000
Silver Horn Mining Co., Limited, Toronto..... 50,000
Silver Bell Mining Co., Limited, North Bay.... 250,000
Silver Cliff Mining Co., Limited, Ottawa 2,000,000
Silver Cobalt Mining Co., Limited, Toronto..... 2,000,000
Silver Wonder Mining Co., Limited, Toronto .. 300,000
Silver Ledge, Limited, Toronto 20,000
Silver Crown Mining Co., Limited, North Bay... 500,000
Steep Rock Development Co., Limited, Fort Frances 150,000
Sudbury Cobalt Mining Co., Limited, Sudbury.. 300,000
Soo-Cobalt Mining Co., Limited, Cobalt..... 50,000
Sasagenga Mining Co., Limited, Cobalt 250,000
Silver Lion Mining and Developing Co., Limited, Cobalt 500,000
Temagami Silver Mining Co., Limited, Sturgeon Falls 150,000
Tarentoris Mining Co., Limited, Sault Ste. Marie 700,000
Temagami Iron Mining Co., Limited, Toronto.. 40,000
Temiskaming Sterling Mining Co., Limited, Milberta 40,000
Trethewey Silver Cobalt Mine, Limited, Toronto 1,000,000
Twin Lake Mining Co., Limited, New Liskeard. 500,000
Temiskaming Hematite Iron Co., Limited, Toronto 42,000
Two Lakes Lapper Mining Co., Limited, Sowerby 500,000
University Mines, Limited, Toronto 1,000,000
Violet Mining Co., Limited, Toronto 250,000
Wiliamson-Marks Mines, Limited, Toronto..... 300,000
Windigo Lake Co., Limited, New Liskeard..... 50,000
Wonderland Silver Mining Co., Limited, Windsor 250,000
Walstress Cobalt Silver Mining Co., Limited, Windsor 250,000
Wendigon Silver and Copper Mining Co., Limited, Windsor 400,000
Wabi Cobalt Silver Mining Co., Limited, Cobalt. 500,000
Wright Silver Mining Co., Limited, Toronto... 200,000

Williams Copper Mining Co., Limited, Toronto. 100,000
Watts Mines, Limited, Toronto 1,000,000
Waterloo Mining Co., Limited, Berlin..... 200,000

Gazetted Since Nov. 1, 1906.

Golden Park Mining Co., Limited, Windsor 100,000
Colonial Mining Co., Limited, Cobalt..... 100,000
Waterloo Mining Co., Limited, Berlin 200,000
Bailey Mining Co., Limited, permission to increase capital, $500,000 to 1,000,000
Heathcock Mining Co., Limited, Dresden 100,000
Larder Lake Gold Mining Co., Limited, Haileybury 500,000
Rochester-Cobalt Mines, Limited, Cobalt 1,000,000
New York Silver Mines, Limited, Toronto..... 1,000,000
Cobalt Portage Mines, Limited, Toronto 1,000,000
Manhattan Cobalt Mining Co., Limited, Toronto. 100,000
Little Nipissing Silver Cobalt Mining Co., Limited, Toronto 650,000
Victoria Silver Cobalt Mines, Limited, Toronto. 1,000,000
Cross Lake Consolidated Mining and Milling Co., Limited, permitted to increase capital from $1,000,000 to 1,500,000
Green-Meehan Mining Co., Limited, Toronto.... 2,500,000
Exploration Company of Canada, Limited, Toronto 100,000
North Cobalt Mining Co., Limited, Cobalt 50,000
Cobalt Native Silver Mining Co., Limited, Haileybury 500,000
Ruby Silver Mining & Developing Co., Limited, Hamilton 500,000
Hunter Cobalt Silver Mining Co., Limited, Ottawa 1,000,000
Nova Scotia Silver Cobalt Mining Co., Limited, Toronto 2,000,000
Cobalt Union Mines, Limited, Toronto 1,000,000
Douglas Mining Co., Limited, Toronto 500,000
Lorrain Mining Company, Limited, Toronto.... 400,000
Cobalt & New Ontario Prospectors, Developers and Investors, Limited, Toronto 500,000
Empress Cobalt Silver Mining Co., Limited, Toronto 500,000
Temiskaming Mining Co., Limited, Toronto.... 2,500,000
Forest Reserve Mining Co., Limited, Toronto.. 100,000
Cobalt Annex Silver Mines, Limited, Haileybury. 500,000
Imperial Cobalt Silver Mining Co., Limited, Toronto 1,000,000
Edward Cobalt Mines, Limited, Toronto 100,000
Cobalt Smiley Mining Co., Limited, Toronto... 40,000
Cobalt Monarch Mining Co., Limited, Toronto. 1,000,000
Coin Silver Mining Co., Limited, Windsor 300,000
United Silver Co., Limited, Cobalt 1,000,000
Cobalt Electrical Development Co., Limited, Haileybury 500,000
Calumet Cobalt Mining Co., Limited, Haileybury 500,000
Esperanza-Cobalt Mines Co., Limited, Windsor. 1,000,000
Cobalt Silver Ores, Limited, Toronto 1,000,000
Latchford Silver Mining Co., Limited, Toronto. 100,000
Ross Cobalt Silver Mines Co., Limited, Cobalt.. 1,500,000
Anima-Nipissing Silver Mines, Limited, Cobalt.. 300,000
Cuyahoga Silver Cobalt Mines, Limited, Toronto 1,000,000
Coniagas Mines, Limited, St. Catharines 4,000,000
Southern Belle Cobalt Silver Mining Co., Limited, Cobalt 1,000,000
Northland Mining Co., Limited, London..... 250,000
British American Cobalt Mines, Limited, Toronto 3,000,000
Cobalt Bullion Mines, Limited, Haileybury..... 1,000,000
Isa Mining Co., permitted to increase capital from $40,000 to 1,000,000
St. Paul Cobalt Mining Co., Limited, Cobalt.... 600,000
Dufferin Cobalt Silver Mining Co., Limited, Ottawa 1,000,000
Anthony Blum Gold Mines, Limited, Toronto... 100,000
Coleman & Quebec Mining Co., Limited, Ottawa 1,000,000
Algoma Custom Smelting & Refining Co., Limited, Sault Ste. Marie 250,000
Stellar Silver Cobalt Corporation, Limited, Sudbury 1,000,000
Old Chap Mining Co., Limited, Cobalt..... 1,000,000
Cobalt Silver Prince, Limited, Cobalt 1,000,000
Cobalt Silver Chief Mining, Limited, Toronto .. 600,000
Canadian Cobalt Corporation, Limited, Toronto. 1,000,000
Cobalt Merger, Limited, Toronto..... 3,000,000
Nepigon Mines Co., Limited, Toronto..... 5,000,000
Keewatin Silver Cobalt Mining Co., Limited, Toronto 1,000,000
Silverado Cobalt Mines, Limited, Cobalt 1,500,000
United States Cobalt Company, Limited, Toronto 3,000,000
Peerless Larder Lake Mines, Limited, Toronto.. 1,000,000
Davis Silver Cobalt Mines, Limited, Toronto .. 2,000,000
Jury Copper Mines, Limited, Sault Ste. Marie.. 1,000,000
Gold & Silver Mountain Mining Co., Limited, Cobalt 1,000,000
Burroughs Larder Lake Gold Mining Co., Limited, New Liskeard 500,000
Big Six Silver Cobalt Mines, Limited, Cobalt... 1,750,000
Brooks Hudson Silver Mining Co., Limited, Haileybury 500,000
St. Anthony Cobalt Mining Co., Limited, Haileybury 100,000
United Mines of Cobalt, Limited, Toronto 1,000,000
Trout Lake Cobalt Mining Co., Limited, Montreal 3,000,000
Campbell-Crawford Cobalt Silver Mining Co., Limited, Cobalt. 1,000,000
Cobalt Lake Mining Co., Limited, (not yet gazetted), Toronto (probably) 5,000,000

Companies Licensed.

The Pioneer Mining Co., Arizona.
J. B. & J. C. Mining, Devel & Smelting, Illinois.
Drummond Mines, Limited, Canada.
Verona Mining Co., New Jersey.
Northern Engineering & Supply Co., Canada.
Manitou Mines Co., Arizona.
Kerry Mining Co., New York.
Consolidated Mining & Smelting, Canada.
Arizona Cobalt Silver Co., Arizona.
Cobalt Securities Co., New York.
Can.-American Mining & Development Co., New York.
Braddock Development Co., Oklahama.
Amalgamated Silver Mines, Maine.
Olympia Gold Mining Co., Arizona.

BOOK REVIEWS.

Messrs. Hayden, Stone & Co., 25 Broad street, New York, have issued a pamphlet, "Record of Curb Transactions for the Year 1906," It is worth reading.

"Electrical Wiring and Construction Tables," by H. T. Horstmann and Victor H. Tousley comes in neat pocket size, with round corners. It contains hundreds of easy, up-to-date tables, covering everything on electric wiring. It is published by Frederick J. Drake & Co., 350-352 Wabash avenue, Chicago, at $1.50 net.

"After Earthquake and Fire," has been published by the Mining and Scientific Press of San Francisco. It is a reprint of the articles and editorial comment appearing in that journal following the destruction of San Francisco on April 18th, 1906. Like everything that its talented editor, Mr. T. A. Rickard, pens, those articles and editorials, for which he is responsible, are well written. Several of the other contributions are also worth reading.

Y? is the title of a pamphlet issued by the Canadian Rand Drill Company, of Sherbrooke, P.Q., descriptive of the Little Giant drill which they manufacture. Why are these drills being used exclusively by the Grand Trunk Pacific; in Cobalt; at Niagara; on the C.P.R. track; at Quebec asbestos mines; in the Sudbury nickel district; in British Columbia and elsewhere? For an answer to these questions, you should apply to the before-mentioned company.

The Geological Survey of the State of Ohio has published a bibliography of Ohio geology.

Part 1, contains a subject index of the publications of the Geological Survey of Ohio, from its inception to and including Bulletin 8 of the fourth series, by Allis Greenwood Derby, B.P.H. and B.A.

Part 2, contains a bibliography of the publications relating to the geology of Ohio, other than those of the State Geological Survey by Mary Wilson Prosser.

The annual report of the Department of Indian Affairs for the year ending January 31st, 1906, has been issued. A perusal of this interesting volume shows that the Indians are increasing at the rate of about 2,000 a year; such increase being mostly in the older provinces, and the total gain would have been yet larger had it not been for the terrible mortalities in the Northwest provinces and beyond the treaty limits. There is no doubt that our Indians are gradually adapting themselves to civilized living, and those that have been longest in contact with white men, are, naturally, farthest on the road to safety.

A Compressed Air, issued by the Kobbe Company of 90-92 West Broadway, New York, contains in its issue for December, 1906, an extract of a paper read before the Engineers' Society of Pennsylvania by Mr. Lucius I. Wightman upon compressed air, which contains much information dealing not only with the past history of air compression, but with its present development. Mr. Wightman points out that high pressure compressors are no longer freak machines, unreliable and largely experimental. Increased use of air under high pressure urgently demand a solution of the problems involved, and the pneumatic engineer has been equal to the task.

PERSONALS.

Messrs James and J. K. L. Ross and F. L. Wanklyn have been visiting Cape Breton.

Sir Henry M. Pellatt has been appointed president of the Cobalt Lake Mining Company.

Mr. Rekemer, of H. B. Wills, Toronto, has returned from the Trethewey Mine in Cobalt.

Mr. D. C. Rochester has been appointed managing director of the Cobalt Lake Mining Company.

Mr. P. J. Flynn, of Cobalt, has been visiting Toronto in the interests of the Cobalt Central Mining Company.

Mr. J. W. Osborne, of the Standard Bank, has gone to Cobalt to take charge of the new branch being opened there.

Mr. Henry G. Adler has been appointed general manager of the Foster Cobalt mine in place of "Lucky Scott," resigned.

Mr. J. Eastwood, mine broker, of Toronto, has been visiting Cobalt. He inspected the Green-Meehan, Foster and Silver Leaf properties.

Mr. A. G. Browning, barrister, North Bay, has visited Toronto in connection with Silver Leaf business. He is the president of this company.

Mr. J. H. Stevens, retiring manager of the Silver Queen Mining Company, was given a dinner at North Bay recently, at which one hundred of his friends were present.

Mr. Frank C. Loring has resigned his position as general manager of the Trethewey Silver-Cobalt Mine, Limited, but he will remain with the mine as its consulting engineer.

Mr. H. Mortimer-Lamb, secretary of the Canadian Mining Institute, has been in Toronto arranging for the holding of the annual meeting of the Institute in that city next March.

Mr. Henry Roy, President of the Canadian Ore Refining Company, appeared recently before the Hull Town Council, in regard to the proposed establishment of a refinery at Hull.

Provincial Mineralogist Robertson, of British Columbia, has returned from a long journey through the northern parts of that province. He is very optimistic as to the future of the territory he visited.

Finance Minister Fielding, accompanied by Premier Murray, of Nova Scotia; Hon. Wm. Templeman, Mr. A. C. Ross, M.P. for Cape Breton; and B. F. Pearson, of Halifax, went to Cobalt on Jan. 7, on an inspection tour.

Among recent visitors to Cobalt Camp were Byron E. Walker and E. G. Jemmett, of the Canadian Bank of Commerce. They were accompanied by Mr. Cassels of the Yonge street branch of the bank, and Mr. Walker's son. The party visited the Nipissing, McKinley-Darragh, Buffalo, Jacobs and other prominent mines.

MINING NOTES.

The Imperial Coal Company, operating at Beersville, New Brunswick, are planning to establish a brick-making plant with a capacity of twenty thousand a day. Henry O'Neil, the New York dry goods magnate, is the president of the company.

The striking advances lately made in Canadian Pacific have led to many enquiries as to the reason. It is well-known that the company is making money, and that the ratio of expenses has been declining when there constantly is an increase in the cost of operation on American lines. But this cannot altogether account for the recent heavy investments in Canadian Pacific.

Information leads to the belief that this line has in anticipation a heavy increase in a most profitable form of traffic, and from a reliable authority it was learned that within seven months the road will be hauling iron ore in large quantities from the newly-discovered beds on the south shore of Lake Superior on Thunder Bay, not far from Port Arthur. An expert estimate is that by July next the road will be carrying perhaps 100,000 a month from Port Arthur to Quebec, and double that tonnage by the summer of 1908. What the Canadian Pacific will get out of it is more or less conjectural, but it is thought that it will not be less than $1 a ton.

It is said that the firm of M. A. Hanna & Co., of Cleveland, will handle the ore taken from the Thunder Bay deposits, which fact will tend to give the enterprise a sort of international flavor. Ore shipped to Quebec will be put on to vessels at that port and transported to England, which is ready to receive all it can get. That country now obtains its iron ore from Norway and Sweden and Spain, having none of its own and being compelled to buy abroad.

In return for this ore England will ship coke back to Canada, the all-water route to be taken from Quebec to Thunder Bay, where a huge plant will be erected for the purpose of turning the ore into pig iron. It is the intention, also, to erect a steel plant at Port Arthur.

NEW BRUNSWICK.

Charles N. Crowe, of Nova Scotia, Arthur S. Basker, of London, England; C. J. Coster, J. H. A. L. Fairweather, and H. H. Brittain, of St. John, are applying for incorporation as the Canadian Antimony Co., Ltd., with a capitalization of $250,000, with head offices at Lake George, York County, New Brunswick.

The company proposes to take over from C. Noble Crowe, Mine Manager of North Brookfield, Queens County, Nova Scotia, the option to purchase certain

lands and real estate acquired from the trustees of the Brunswick Antimony Company, and gold mining areas covering said lands, acquired from the Province of New Brunswick, and the option to purchase certain mineral and mining rights other than gold covering said lands, acquired from Mary Matilda McCallum, situate at Lake George, York County, province of New Brunswick, Canada.

ONTARIO.

Another attempt is being made to work the McGown and Willcocks copper mines, near Parry Sound. McKeown & Co., Pittsburg capitalists, have taken an option, and are now at work opening up the mines. A year ago considerable gold and copper was taken out of the McGown mine. The Willcocks mine contains considerable lower grade ore.

Work on the Atikokan Iron Co.'s plant is progressing very satisfactorily. When completed this blast furnace will be of immense value to this section of the country. The Canada Bridge Co., and the Canada Furnace Co. are both entirely through with their contracts and the L. S. Shiner Construction Co., of Cleveland, who have the contract for the installation of the coke ovens and roaster expect to finish up their work in about two weeks. Kelly & Co., of Minneapolis, the contractors for the steam and gas fittings, now have nearly a hundred men employed, the purpose to push their end being that the plant may go into operation next April.

The Larder Lake region is situated 75 miles north of Cobalt, and is within three miles of the Quebec boundary, being ten miles to the east of Temiskaming Railway. Prospectors, and there are dozens of them leaving Cobalt daily, it is asserted, have to cover the ground by means of snowshoes, but when the frost king has loosened up his grip the work of the voyageur will begin.

Starting from Temiskaming Lake he will steer his canoe up the Blanche River to Tomstown and an overland jaunt of six miles will bring him to the shores of Windego Lake, where is a stopping place at which his supply of provisions may be replenished. Continuing his trip up a claim of small lakes he will arrive at his goal after having made ten portages.

The decision of Messrs. J. S. and W. S. Kuhn, the Pittsburg millionaire mine-owners, to spend five millions in exploiting the copper mines of the Parry Sound district, as authoritatively announced lately, has drawn considerable attention to that comparatively new copper country. It is understood that the Kuhns will include the McGowan, Wilcox, and Spider Lake claims, Mr. Thomas A. Wood of Parry Sound, has been busy all summer, making tests, and demonstrating the wonderful value of the copper mines in the Parry Sound District, on behalf of the Kuhns. The opening of the Canadian Northern Railway between Toronto and Parry Sound town, has given a new impetus to the work. Again, the Parry Sounders are projecting a big smelter.

"Folks have been so busy with Cobalt," said a prominent mining man the other day, "that they haven't had time or inclination to investigate the resources of the province, in the matter of copper. With the growing demand for copper wire, and all kinds of copper utilities and utensils, the value of the mineral is soaring. I wouldn't be surprised if we have a big rush to the Parry Sound copper country shortly. Where there are big deposits of copper, it has frequently been shown that gold is also to be found in paying quantities."

Existence of copper in quantities has been known for years, but the difficulties of exploitation were too great for the Canadians. It remained for the Kuhns to see enough in the prospects of the Parry Sound District as a copper producer to put any amount of work and capital in it.

The McGowan mine is 140 acres in extent. From this mine a quantity of bornite or purple copper ore was taken, and the assay was over 60 p.c. copper. Three shafts have been sunk on the McGowan, one on the incline, one straight down 140 feet, and another 300 feet. The Wilcox covers 160 acres and is six miles south of Parry Sound. There are three shafts on the property, 130, 30 and 20 feet deep, respectively. This is a producer of low grade, which assays about five to six per cent. copper. Adjoining to the west is the Spider Lake mine, and it carries practically a continuation of the Wilcox veins. A lot of development work is also taking place in the Moon River country, twelve miles south of Parry Sound.

The shipments forming the output of the silver-cobalt mines of the Cobalt region have recently been issued by the Ontario Bureau of Mines for the nine months ending September 30th last.

The cobalt, nickel and arsenic contents of the shipments are to some extent estimated, since the purchasers of ore in most cases pay nothing for these constituents, and no assays for them are made.

The fact remains, however, that for the nine months there has been shipped 2,542,827 ounces of silver, worth $1,609,554, and in October 1,120 tons additional ore has been shipped. Averaging the price of this 1,120 tons at the same rate as for the 2,305 tons shipped in the preceding nine months it would come close on $800,000, or, say, a total of $2,400,000 in round figures for the ten months of 1906.

The figures for the Cobalt shipments are as follows:

	Quantity.	Value.
Ore mined, tons	3,198	
Ore shipped, tons	2,305	
Silver in ore shipped, ounces	2,542,827	$1,609,554
Cobalt in ore shipped, tons	138	110,400
Nickel in ore shipped, tons	69	16,560
Arsenic in ore shipped, tons	691	13,830
Total for nine months		$1,750,344

The output of other metalliferous mines and works in Ontario, in addition to the Cobalt table, includes chiefly the nickel and copper from Sudbury and the iron ore of the Helen Mines. This is reckoned over again in the manufactured state as pig iron and steel. These items are, of course, increased by imported material.

The return for the nine months ending Sept. 30 follows:

	Quantity.	Value.
Gold, ounces	2,015	$34,377
Silver, ounces	2,542,827	1,609,400
Cobalt, tons	138	110,400
Nickel, tons	8,037	2,856,223
Copper, tons	3,900	600,000
Iron ore, tons	93,159	117,466
Pig iron, tons	208,094	3,194,206
Steel, tons	123,257	3,059,070
Zinc, tons	300	4,500
Arsenic, tons	691	13,830

These figures show a considerable advance over those for the same period of 1905, and indicate that the production for 1906 will be much the largest of any year in the history of metalliferous mining in Ontario.

COBALT.

A carload of silver ore from the West End Mine, now known as Hanson Consolidated Mines, was shipped to Omaha on Dec. 27, from Port Arthur. The car represented $15,000.

Cobalt mining suits are almost as numerous as Cobalt mosquitoes, or Cobalt nuggets—which shows, at least, that the camp is very much alive. There are few suits in "has been" camps.

The directors of the Coniagas Company are issuing a statement to shareholders, reporting progress. This company's output nets a profit of about $100,000 per month, and if this continued, a dividend would be expected in March or April.

The New Liskeard Speaker repeats the denial of the directors of the Clark Standard that they have sold their property to an English syndicate for $500,000. The story arose out of the fact that Messrs. Armstrong and Grills went to Toronto to negotiate a sale, but did not succeed.

Henry G. Adler has been appointed general manager of the Foster mine, to take the position recently filled by "Lucky" Scott. The new general manager was for three months in charge of the University mine. He is regarded as an excellent selection, having had considerable experience in that line in South Africa.

A proclamation from the Ontario Government was issued on Dec. 20, declaring the incorporation of Cobalt as a town. The nominations for the first municipal elections took place on Dec. 31, and the elections on Jan. 7. This action was taken by the Administration in consequence of a petition from the residents of the famous silver camp.

The Nipissing Mines Co. has declared a total of $780,000 in dividends since its organization. In view of the fact that the company in its recent statement asserts that earnings will not be as large over the next three months as they have been since Sept. 1, and the fact that the principal vein, No. 49, has shown a decided decrease in values with depth, it can hardly be said that the quarterly dividend of 3 per cent. and 2 per cent. extra, declared this month was conservative.

On March 31st the Nipissing Mines Co. reported net earnings available for dividends at $600,000, as compared with $794,288 at present, an increase of $194,288. Out of the $794,288 reported, a dividend of 5 per cent., or $300,000, is payable on Jan. 2, leaving a balance of $494,288. Of course this balance will be increased by returns from now until the dividend of 5 per cent. is paid. It would seem, however, that the balance on hand after the payment of 5 per cent. to stockholders will not be much greater than reported nine months ago. As a result of the deterioration of the ore, operating expenses hereafter are more likely to show an increase than a decrease.

A contact of the Huronian with the Keewatin, dipping at an angle of about 25 degrees, occurs on the surface of the Trethewey near the open-cut west of the shaft house. This contact is next encountered in the shaft at a depth of about 60 feet. Predictions had been made that values would cease when the Huronian was reached. These have been shown to be false. The contact has long since been passed, and the shaft right on the vein sunk for a further depth of 60 feet wholly in the Huronian. The width and values of the vein have been steadily maintained. In a few days this contact will be struck again in the drift at the 100 foot level and will be followed from the Huronian into the Keewatin.

The discovery of a large body of low-grade ore at the 12-foot level on the Trethewey is regarded as a matter of importance by mining men. It is claimed that it goes far towards insuring the permanency of the Cobalt camp, and will afford profitable mining for years to come, without regard to the high-grade product which has made Cobalt famous. This low-grade ore will assay from 40 to 100 ounces to the ton, and its average value will be about $30 to the ton. In quantity it is stated that nothing in the Cobalt district that will at all compare with it has as yet been uncovered. Quite a little quantity of native silver is scattered about in this low-grade ore. The discovery is of great importance to Trethewey, which has shipped $500,000 of high-grade material since the property was first worked.

The Cobalt Lake Mining Company was organized in Toronto on December 27. The capitalization is $5,000,000, divided into 5,000,000 one dollar shares. The issue of treasury stock will total 400,000 to 600,000 shares, and these will be taken up by the shareholders, and not issued to the general public. The stock will be listed on the New York, Montreal, and Toronto stock exchanges. It is expected that the over-subscribers will take up all the treasury stock.

The election of directors resulted as follows: Sir H. M. Pellatt, president; George H. Henderson, Ottawa, vice-president; F. Latchford, Ottawa; H. S. Southam, Ottawa; John H. Avery, Detroit; D. B. Rochester, Ottawa; George E. Drummond, Montreal; Thomas Birkett, Ottawa; and Mr. Britton Osler.

A Cobalt despatch says: The Victoria Silver Cobalt Mines, Limited, has made a good strike on its property. It has 29 acres lying south of the Colonial, west of the King Edward, north of the Nova Scotia, and west of the Nipissing, and has been working the property for some weeks. Two shafts have been sunk in two different veins, each to a depth of 20 feet, and the quality of the ore body improves with depth. A large bunk house and cook camp have been built, and 26 men are now steadily employed. Nine veins have been uncovered, and test shafts will be sunk on each. Nickel bloom has been encountered in large quantity from the surface. The find was made a short distance from the Nova Scotia. Cross Lake mines are known to be rich, and veins are being worked on the four properties adjacent to the Victoria, by two steam hoists, a six-drill compressor, and two 60-horse power boilers have been ordered. Charles Giffard, formerly of Spokane, is superintendent; M. E. Deaguere, member of the New York Stock Exchange, is president; G. O. Van Ness, vice-president, and M. O. Gildersleeve, secretary.

The Ontario Government has accepted a tender for a bonus of $178,500, in addition to a royalty of ten per cent. on the gross value of the ores mined, for the unalienated portion of the bed of Kerr Lake, in the Cobalt district, an area of twenty-three acres.

The successful tenderers are Messrs. C. E. Potter, general manager of the City Dairy Company, Toronto, and G. F. Ross, of Montreal, acting on behalf of themselves and a number of other people in both of these cities.

There were six other tenders, their respective amounts being $176,000, $132,000, $122,200, $105,050' $101,000 and $23,000.

The time for receiving tenders, which were accepted at the Lands, Forests and Mines Department, expired at one o'clock January 9.

When the tenders were opened and laid before the Cabinet, the members had no difficulty in deciding as to which should be accepted. All the tenders were devoid of any qualifications, adhering strictly to the form as laid down in the advertisement, being accompanied in every case by a marked cheque for ten per cent. of the amount of the tender.

The purchase of Cobalt Lake by a large and representative syndicate of Canadians for over a million dollars is a good answer to the Guggenheims. The personnel of the syndicate is so numerous that it almost resembles a popular subscription. It shows that Canadian confidence in the big camp is not only unshaken, but stronger than ever, and it will have a good effect. The slump which followed the Guggenheim stock-broking "knock" will be an advantage to both Cobalt and Canadians. It cooled the heads of the unreasoning investors and stock gamblers, and is now giving Canadians an opportunity to get their money up on really good investments at moderate values. Cobalt is just as good, or better, to-day than it was before the Guggenheims heard of it, but the evidence accumulates that there has been a systematic attempt to "bear" it for a purpose. That attempt has in a large measure failed. The latest feature of the campaign is the assertion that the rich surface values cannot possibly go deep. This chestnut has been in circulation ever since the first discovery was made and

has just as much reason behind it as the reverse proposition that the veins will get richer as they go down. There is only one answer to it. The only mine in Cobalt that has a shaft down over 300 feet is the Larose, and stock in the Larose cannot be bought for love or money.—Ottawa Citizen.

Control of the McKinley-Darragh-Savage Mines of Cobalt, Limited, has just passed into the hands of New York capitalists, the deal involving a consideration of $3,750,000, which represents a few shares in excess of 1,250,000, half the authorized issue. The deal is one of the largest to be consummated since the first discovery of silver in the Cobalt district.

McKinley-Darragh-Savage is incorporated under the laws of Ontario at $2,500,000, in shares of $1 each. The officers and directors include F. B. Chapin, president; Thos. W. Finucane, vice-president; W. L. Thompson, treasurer; A. E. Osler, secretary; H. W. Sibley, J. S. Hunn and C. A. Masten. The head office is in Toronto.

The first discovery of silver was made at the Cobalt camp on this property. It was also the first lot to be surveyed. The company owns lot J. B. 1, consisting of 40 acres at the southerly end of Cobalt Lake, four acres being under water. They also own the property of the Savage Cobalt Silver Mining Company, Limited, consisting of 42 acres, acquired some months ago, in the Kerr Lake district. A claim in Bucke is said to be part of the company's holdings also. According to a mining engineer who was interviewed recently the outlook on this property is of an exceptionally high order. His statement is that on the main working the vein has dropped through the conglomerate into the diabase, a volcanic formation, which goes down deeper than it will ever be humanly possibly to mine. This assertion, if well substantiated, is of great importance to the future of the camp. Up to the date of consolidation, the mine has shipped $160,000 worth of ore, and last July the new company shipped its first carload of forty tons. It has been shipping steadily since that time. There is said to be some five hundred tons of low-grade ore on the dump that average 100 ounces to the ton.

The decline in Nipissing shares has been responsible, says the Wall Street Journal, for many erroneous statements as to the treatment of Cobalt ores. It is true that these ores are refractory and difficult to treat, and that it is still an open question as to the best methods of treating them, but these difficulties have not prevented the smelting of the ores. It has, however, prevented the winning of the full values. Cobalt ores run on an average of 40 per cent. arsenic, which is the chief obstacle in their proper treatment. The entire output of the Cobalt camp is now about 30 tons of ore per day. There is probably a loss of $600 per ton in the treatment of the high-grade Cobalt ores in the smelting which naturally comes out of the producer. The smelters make no treatment charge. They buy the ores on the cars at Cobalt, allowing the producer 91 to 95 per cent. of the silver values in the ores. In addition, the shipper pays the freight and the sampling charge. Nine-tenths of all the ore shipped to Jersey City has been going to the Balbach smelter, and the ore has been sampled by Dr. Ladoux. Both shipper and smelter take his assays as final. It is understood that comparatively few shipments have been made to the American Smelting and Refining Co., but when the Guggenheims arranged to take over the Nipissing property they had prepared plans for building a smelter at Perth Amboy to treat the Cobalt ores exclusively.

The leading handler of Cobalt ores is the Canadian Copper Co., which is the operating company of the International Nickel Co. That company has built a smelter at Sudbury, Ont., with a capacity of ten tons per day to treat Cobalt ores exclusively. It has a secret process whereby it saves the cobalt and nickel from the ores. It has been giving better returns to the shippers than the Jersey City smelters, but many of the shippers prefer to ship to Jersey City than to Sudbury. It is apparent that there is sufficient smelter capacity to treat the Cobalt ores now coming on the market, and that while they may be refractory in nature they are so rich in silver values that the producers can afford to stand the heavy losses that now occur in the present method of ore treatment.

According to Mr. Frank C. Loring, consulting engineer of the Trethewey Cobalt Mining Company, it would not be surprising if in 1907 the production of the camp were 20,000,000 ounces or more of silver. Unfortunately the mines receive no settlement for cobalt and nickel; should they do so the returns of the district would largely increase.

During the past season the area upon which ore has been discovered has widened materially, especially to the southeast of Kerr Lake, to the west of Cobalt and in the neighborhood of New Liskeard.

There is no doubt that the silver producing territory in the neighborhood of Cobalt will widen, but that other districts will be discovered in the region of the northeast and west.

Geological conditions at Cobalt repeat themselves many times, and although prospecting, owing to the carpet of underbrush, is difficult, it is only a question of time when there will be many rich mining districts developed in that region.

It has been the impression that all of the veins at Cobalt are simply gash veins and have no great extent either laterally or at depth. Although it is undoubtedly true that some great number of these veins may exist, many of them are limited in their extent and there is no doubt but that there are extensive systems of strong fault fissures, wherein the rich ore is simply an incident, and wherein there also exists other ore of a lower grade, but still of value. These fissures have much greater extent than have the ordinary gash veins, and so long as they exist the extent of the rich ore for a considerable distance, is more certain.

The Cobalt Lake Mining Company, which was organized on Dec. 27, with Sir Henry M. Pellatt as president, was relieved two days later from an injunction by Mr. Justice Mabee restraining the transfer of mining privileges by the trustees of the Cobalt Lake property to the new company. The injuction is dissolved, on the understanding that sufficient capital stock be left in the treasury to satisfy all claims of those who state they subscribed to the syndicate after the books closed. It reads as follows:—

"Upon the defendants, the Cobalt Lake Company, undertaking to retain in the treasury sufficient of the capital stock of the company for distribution among such persons as subscribed to the syndicate or syndicates in question after the closing of the books, if the plaintiff, or such persons is or are able to establish any rights by reason of such subscriptions, without prejudice to the plaintiff proceeding in this action for the recovery of damages for any of the alleged breaches of trust committed by the defendants or any of them, otherwise as the plaintiff may claim, it is ordered that the injunction be dissolved. Costs in the cause, unless otherwise ordered by the trial judge."

BRITISH COLUMBIA.

The Northport smelter resumed operation during the last week of 1906. The intention at Le Roi mine, now that the smelter has resumed operation, is to increase the daily output of ore to about double what it is at present.

The supply of coke is increasing at Trail and during the week ending December 24, another copper furnace was blown in, making three in operation. It is anticipated that soon all of the five copper furnaces will be blown in and then the plant will be reducing 1,700 tons daily.

The smelters of Kootenay are overstocked with ore taken in during the coal strike at Crow's Nest. The Nelson smelter has half a million dollars in stock. The lead mines are negotiating with Everett, Ymir and Laplate, for they have nealy fifteen hundred tons of lead and concentrates.

Everett offers more favorable freight and treatment rates than either the C.P.R. smelter, Trail or Hall mines at Nelson, but now cars are unprocurable. Shipments from Krao, recently purchased by Butte capitalists, will be delayed. A big deal near Nelson will be shut out because American purchasers find themselves unable to ship.

In the shaft of the Grand Prize property located north of Rossland, a find of free gold has been made. One piece of ore is impregnated with free gold in nugget form. The extent of the find has not yet been determined, although the ledge is about four and a half feet in width. By many it is considered important, as it reveals that another section of the Trail coke division promises to develop valuable mines.

Information has been received in Rossland from the east that the officials of the Dominion Copper Company at a meeting held a few days ago in New York, were so well pleased with the work being done at the company's mines at Phoenix and at the smelter at Boundary Falls that it had been decided by the board to enlarge the smelting works with three more furnaces, giving the plant a total capacity of 3,400 tons of ore per day. With two furnaces now in commission and a third now being erected this will make six blast furnaces at this smelter. The improvements will cost in the neighborhood of $150,000 and will be paid for from earnings. It will require the better part of 1907 probably to get the new furnaces installed.

E. A. Ritter, M.E., of Colorado, has returned from Cariboo. He is reported to have said:

"There are 28 different hydraulic mines working in the Cariboo district properly, around Barkerville. I have simply given the salient features of the more important to show that all the mines are working in old pre-glacial channels, different from the river beds of to-day. These channels are very much alike and the characteristics of the layers of sands and gravels, mixed with the big boulders scattered through the lower part of the bank are very uniform. These channels vary in width from 80 feet to 150 feet, and from 50 feet to 150 feet in height. The average values per cubic yard range from 5 cents or 6 cents to 40 cents. Almost all these mines wash from 10,000 to 100,000 yards annually.

"There is only the Hobson mine of the Consolidated Cariboo Hydraulic Company recently bought by the Guggenheim Exploration Company for $1,500,000, which has a very large yardage washed to its credit. But this mine is really in the Quesnel mining division and not in the Cariboo. It has produced over $1,250,000 in the past and is increasing tremendously its water supply, bringing from the railroad two steam shovels to dig ditches 22 miles long and 25 feet wide.

"The different sluice boxes of the various mines are paved with 8-inch riffle blocks; the width of the sluice flumes varies from 18 inches to 3 feet except at the Bear mine, where the two flumes are 4 feet and 6 feet wide, respectively.

"The past experience at the Bear mine is that 95 per cent. of the gold is recovered in the first 150 feet of the flumes. The same result is obtained at the Eight-Mile Lake mine. At the Waverley most of the gold stays in the ground-rock sluice, before reaching the flume and the same is true at China Creek. At the Bear, the Eight-Mile Lake and China Creek mines the gold is not very coarse and varies from fine gold to nuggets worth $5 each. The average size of the nuggets is like a flaxseed; they are from 1½ to 5 cents in value. Stevens' Creek and Waverley recover coarser nuggets. The China Creek mine is the only one to have an undercurrent and this one has proved enough of a success to induce other mines to do likewise.

"There are several old channels not worked now, which promise good returns if properly equipped and managed. It is probable that during the next few years the Cariboo district will see several new mines opened up, equipped and worked successfully."

YUKON.

A Detroit despatch says that negotiations are being closed for the amalgamation of the Detroit-Yukon Mining Co., and the Canadian Klondike Co., with the Guggenheim Exploration Co., which means making them a part of one of the greatest mining syndicates in America. Since the companies were formed five years ago they have been accumulating gold-producing properties in the Canadian Yukon, until they now own 44½ square miles. Enough of exploring has been done to satisfy so eminent an authority as John Hays Hammond, the Guggenheims chief engineer, that the land is exceedingly valuable. The Guggenheim Exploration Co. is a New Jersey corporation, formed in 1899, with $17,000,000 capital, by Morris Guggenheim and his four sons.

COAL NOTES.

NOVA SCOTIA.

Shipments from the collieries of the Cumberland Railway and Coal Company for the month of December were 20,731 tons.

The approximate output of the Dominion Coal Company's mines for December was:—

No. 1	30,774
No. 2	43,203
No. 3	20,808
No. 4	26,768
No. 5	27,246
No. 6	11,998
No. 7	5,729
No. 8	15,406
No. 9	24,777
Total	206,709

The approximate shipments for the same month were 130,968 tons.

The Dominion Iron and Steel Company claims $15,000,000 from the Dominion Coal Company. The sum of $400,000 is claimed for damages to the coke ovens, furnaces, loss of profits and increased cost of production up to 30th of November, 1906. The sum of $68,580 is also claimed for the increased price of coal bought from outside sources, and actually delivered to the Steel Company up to the 30th November, 1906.

In addition to the above claim the Steel Company asks that the value of the ninety year contract to the Steel Company be assessed at the sum of $15,000,000, and that the Coal Company be held liable to the Steel Company in that amount. The total amount of the claim is, therefore, $15,468,580.

The statement of claim of the Steel Company against the Coal Company was delivered on January 8.

THE MINING AND INDUSTRIAL SHARE MARKET.

(Specially reported for the CANADIAN MINING REVIEW by ROBERT MEREDITH & Co., Mining Brokers, 57 St. François Xavier St., Montreal.)

There is more interest being taken in mining stocks than for some time past, and it looks as if an active market in these securities is not far off.

In the western mines the feature is the strength and steady advance of the stocks of coal companies and the buying is chiefly by those at, or near the mines. Nearly all the companies are increasing their output and yet do not seem able to keep up with the demand. Some of the Cobalt companies' shares are coming into this market; the late wild trading in New York has spent itself, the volume is greatly reduced and transactions can be on a more reasonable basis.

Business in the industrial shares is still contracted, and the public appears to be leaving them alone. Prices are

irregular, and do not indicate intrinsic value, or the condition of the business.

The latest quotations are as follows:—

	Bid.	Asked.
Consolidated Mines	140	145
Can. Gold Fields	7	8
Granby Consolidated	13½	14
Rambler-Cariboo	28	33
North Star	15	20
Monte Christo	2	3
White Bear	9	10½
California	...	6
Virginia	7½	12
Deer Trail	...	2
International Coal	62½	66
Sullivan	8	10
Cariboo-McKinney	3	5
Denoro	10	13
Diamond Vale Coal	30	35
Alberta Coal & Coke	25½	30
Dominion Copper	7¼	7¾
Novelty	2	3
Nipissing	13½	14
Foster	2½	2¾
Silver Queen	2¼	2⅜
Tretheway	1⅞	2⅜
Kerr Lake	5¼	5⅞
Silver Leaf	25	28
Green Meehan	1 7-16	1½
Peterson Lake	47	51
Dominion Coal (com.)	63	64
Dominon Coal (pref.)	...	...
Dominion Iron & Steel (com.)	23¾	24
Dominon Iron & Steel (pref.)	64½	66
Intercolonial Coal (com.)	...	...
Intercolonial Coal (pref.)	...	...
Nova Scotia Steel & Coal (com.)	71	73
Nova Scotia Steel & Coal (pref.)	...	...

INDUSTRIAL NOTES.

We are in receipt of Mine and Quarry, volume 1, No. 3, which contains some useful papers. One on marble quarrying in Georgia, is lucid and well illustrated; another on Carbons or "'black diamonds," gives a great deal of information as to the mining and marketing of this indispensable material. The reason for the high price of carbon is shown to be the increased demand, with a somewhat diminished production from the Brazilian placers.

Mine and Quarry is issued by the Sullivan Machinery Company, Railway Exchange Bldg., Chicago, Ill., and will be sent to any address upon request.

There is no more flattering endorsement of the excellence of the design and workmanship of a piece of apparatus than repeated orders for it received from a single purchaser. Allis-Chalmers Company's steam turbines and generators, although of comparatively recent introduction in this country, are now being built on the ninth successive order from a single consulting engineer of well-known standing, viz., Mr. Thos. E. Murray, of New York City, who has been instrumental in placing contracts for Allis-Chalmers turbo-generator sets, aggregating 26,000 k.w. in capacity at their normal rating.

The Power and Mining Machinery Company, of Cudahy (suburb of Milwaukee), Wis., in conjunction with The Snow Steam Pump Works of Buffalo, N.Y., has opened a new sales office at 719 White Building, Buffalo, where will be handled the several types of gas generating apparatus, such as the Loomis-Pettibone system, suction and pressure gas plants, built by the Power and Mining Machinery Company, and the Snow Gas engines, built by the Snow Steam Pump Works. Mr. Seward Babbitt, the sales manager of the first named concern, will make his headquarters at the Buffalo office, on account of the facility for conducting business from that point.

Commencing this new year, the firm name of W. H. C. Mussen & Co., railway, mining and contractors' supplies, becomes Mussen's, Limited, a joint stock company.

The change, which makes no difference in the personnel of the company, has been made in order to facilitate the handling of the business.

The company began business in 1901, and the growth has been very steady, until now it is one of the largest supply houses in Canada.

In 1905 a branch office was opened in Toronto, and subsequently in Vancouver and Winnipeg, and this year another branch office will be established in Quebec.

White Jacket Fuse, manufactured by Messrs. Beikford, Smith & Co., Ltd., is their latest invention and is the best fuse now on the market, being superior to the so-called gutta percha, single and double tape fuses. It stands twenty-four hours immersion in water, rough handling and rapid changes of climate and temperature.

The burning speed is very regular, it never runs, neither can the burning stop, as the new and perfected machinery by which it is made make it impossible for fuse to be shipped in which there is a break in the column. It never misses fire.

Messrs. Mussens, Limited, of Montreal, Toronto, Winnipeg and Vancouver are the agents in Canada.

The Canadian Westinghouse Co., Ltd., of Hamilton, Ontario, are distributing a descriptive pamphlet on "Type C Integrating Wattmeters." The returns for your service depend upon the reports of your meters. Westinghouse wattmeters have an unequalled record for accuracy in service and their registration is right at the start and remains right throughout the life of the instrument. The induction motor principle as the basis for its wattmeter design was first adopted by the Westinghouse Electric & Mfg. Company, and it is a significant fact that the original design, with the adoption of such minor changes as years of actual service have demonstrated to be desirable, has remained substantially the same and has so conclusively proved its superiority that its elements have been incorporated in all the successful instruments on the market. The type C wattmeter is the latest and most improved form but its difference from the earlier type is only in degree of development.

The new plant of the Iola Portland Cement Company at Dallas, Texas, is notable for the fact that it will have the largest producer gas power installation in the world. As other plants of the Iola Company, both gas engines and steam engines have been employed, so that in selecting the type of prime mover for their new plant, it was with a knowledge of the capabilities of the respective powers, and their decision was influenced by the saving in fuel consumption that was possible by the adoption of gas for power purposes.

The Loomis-Pettibone gas generating system, built by the Power and Mining Machinery Company, will be furnished in three units having a total capacity of 4,500 H.P. Bituminous coal and Texas lignite will be the fuels used, the Loomis-Pettibone system being adapted to the gasification of either fuel without changes in the apparatus, and the resultant gas is guaranteed to be fixed, clean and suitable for use in gas engines.

The Snow Steam Pump Works, of Buffalo, will furnish for this plant, four of their single-tandem double-acting gas engines, each with a normal capacity of 1,100 B.H.P. These engines will be directly connected to alternating-current 25-cycle electric generators of 819 K.W. capacity each, and will operate in parallel.

Continuous operation, twenty-four hours per day, seven days per week, is required of the power plant.

High efficiency is promised by the builders of the power apparatus, and their guarantees of a kilowatt per hour at the switchboard from 1½ to 1¾ lbs. of bituminous coal or from 2½ lbs. of lignite, when operating at three-quarters to full load, assures the Cement Company of cheap power.

INDUCTION MOTORS.

An admirable example of the application of electricity to mining and manufacturing is at Copper Cliff, Ont. There the enormous plant of the Canadian Copper Company is operated by electricity generated by the Huronian Power Company at Turbine on the Spanish River 25 miles away. Among the different uses to which electric power is now put is to drive blowing engines for facilitating the work of smelting. The illustration shows one of these 70 x 70 x 42 blowing engines driven by a 600 h.p. variable speed induction motor built by Allis-Chalmers-Bullock, Limited, Montreal. Additional induction motors built by the same firm are used for operating air compressors, pumps, cranes and other services in connection with the smelting works.



A 600 h. p. Allis-Chalmers-Bullock Induction Motor driving a Blowing Engine at the Canadian Copper Co.'s Smelter, Copper Cliff, Ont.

THE "IMPERIAL" MOTOR HOIST.

The "Imperial" Motor Hoist, manufactured by the Canadian Rand Drill Co., of Montreal, is designed for use in foundries and machine shops where the handling of flasks and the erection of machinery requires smoothness of action and accuracy of control. Simple in design and operation, moderate in weight and of small outside dimensions, it is especially suitable for shops where head room is limited.

The hoist consists of one of our high pressure, three-cylinder motors geared to a hoisting drum provided with lifting rope and hook. The controlling valve is positive in action and accurately controlled. An exclusive feature is the automatic lock which holds the load in any position without the use of a brake, and prevents it lowering if anything happens to the air supply.

Special attention has been paid to producing a machine which will stand the hardest usage at the hands of unskilled operators, with the least amount of care and attention. The motor is fitted with ground steel working parts throughout, and the transmission gear runs in an oil filled case. These hoists are built in capacities from 1,000 to 10,000 pounds, and are giving splendid satisfaction wherever they are in use. Further particulars and quotations will be given on application to the nearest office of the company.

MINING INCORPORATIONS.

ONTARIO.

Anthony Blum Gold Mines, Ltd. Capital, $100,000, divided into ten thousand shares of ten dollars each. Head office, Toronto. Provisional directors: J. G. Shaw, Joseph Montgomery and James Graham, all of Toronto.

The Old Chap Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: W. H. Francis, F. W. Libbey, R. G. Coan, all of Cobalt.

United Mines of Cobalt, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: C. L. Dunbar, Guelph, Ont.; H. T. Smith and I. S. Fairty, Toronto.

Stellar Silver Cobalt Corporation, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Sudbury, Ont. Provisional directors: J. F. Black, J. H. Morin and Chas. McCrea, all of Sudbury, Ont.

The St. Paul Cobalt Mines Company, Ltd. Capital, $600,000, divided into six hundred thousand shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: A. G. Terrill, S. F. Nelson and Homer Gibson, all of Cobalt.

Keewatin Silver Cobalt Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: J. G. Shaw, J. Montgomery and W. R. Williams, all of Toronto.

The Kerr Lake Lawson Mining Company, Ltd. Capital, $1,500,000, divided into one million five hundred thousand shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: Walter Lawson, of Renfrew, Ont., and Wm. Fred. Powell and Robert Taylor Shillington, of Ottawa, Ont.

The Big Six Silver Cobalt Mines, Ltd. Capital, $1,750,000, divided into one million seven hundred and fifty thousand shares of one dollar each. Provisional directors: W. H. Gates, W. D. Gregory and H. F. Gooderham, all of Toronto, Ont.

Calumet Cobalt Mining Company, Ltd. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: James Francis Gillies, Haileybury, Ont.; John McKay, Sault Ste. Marie, Ont., and John Francis Hope McCarthy, Toronto.

Larder Lake Gold Mining Company, Ltd. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Provisional directors: S. Read, the Younger, J. E. Whyte, D. Stewart, S. Greenwood, A. P. Morissette, all of Liskeard, Ont.

Peerless Larder Lake Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto. Provisional directors: F. Hicks, Duluth, Minn.; W. F. Thomson, W. G. Thomson, J. Moffatt and C. B. Jackes, all of Toronto.

Ore Contracting Company, Ltd. Capital, $40,000, divided into four hundred shares of one hundred dollars each. Head office, Bessemer, Ont. Provisional directors: G. W. Wallace, Detroit, Mich.; H. B. Sturtevant, Delevan, Wis.; Frank Pottage, Toronto.

The Cuyahoga Silver Cobalt Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Harry Sydney Pritchard, Frederic Watt and Frederic Clarence Jarvis, all of Toronto.

Anthony Cobalt Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: R. J. Rowell, W. P. Wilkins, W. J. Quinn, F. W. Bowie and F. A. Day, Haileybury, Ont.

Davis Silver Cobalt Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: G. W. Kenyon, G. A. Stanton, G. G. T. Silsby, of Brooklyn, N.Y.; W. S. Silsby, of New York.

The Gold and Silver Mountain Mine, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: D. H. McAndrew, R. Russell, C. N. Roberts, J. D. McDonald, Thos. Logan, all, of Renfrew, Ont.

The Coniagas Mines, Ltd. Capital, $4,000,000, divided into eight hundred thousand shares of five dollars each. Head office, St. Catharines, Ont. Provisional directors: Henry Smith Osler, John Francis Hope McCarthy and James Miller Ewing, all of Toronto.

Anima-Nipissing Silver Mines, Ltd. Capital, $300,000, divided into three hundred thousand shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: William Black, Sudbury, Ont.; Lewis Elwood Hambly and John Knox Leslie, both of Toronto.

Latchford Silver Mining Company, Ltd. Capital, $100,000, divided into one hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Percival John Montague, Robert Francis Wilks and Francis Pottage, all of Toronto.

Cobalt Silver Mines Company, Ltd. Capital, $1,500,000, divided into one million five hundred thousand shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: Daniel Ford, Walter Tylee Ross, of Montreal, and Phillip O'Reilly, of Ottawa, Ont.

The Jury Copper Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Sault Ste. Marie, Ont. Provisional directors: C. R. Shaw, C. H. Williams, O. B. Jury, S. G. Stone and J. A. McPhail, all of Sault Ste. Marie, Ont.

The Southern Belle Cobalt Silver Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: Thomas Langton the Younger, Michael John O'Neil and John Martin, all of Cobalt.

The Silverado Cobalt Mines, Ltd. Capital, $1,500,000, divided into one million five hundred thousand shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: A. S. Galosha, H. Wallace, P. J. Finlan, H. H. Lang and W. E. Running, all of Cobalt.

Casey Cobalt Silver Mining Company, Ltd. Capital, $1,000,000, divided into one hundred thousand shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: Frank Pottage, George Henry Schakleton and Bessie Mabel Cook, all of Toronto.

The Trout Lake Cobalt Mining Company, of Montreal, Ltd. Capital, $3,000,000, divided into three millions shares of one dollar each. Head office, Ottawa, Ont. Provisional directors: A. C. Brown, B. Burland, J. R. Wright, F. F. Parkins and A. C. Porteous, all of Montreal.

Cobalt Chief Silver Mine, Ltd. Capital, $600,000, divided into six hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: E. L. Bradley, John W. McDonald, Gertrude E. Cherpan, G. J. Valin and Thomas Brown ,all of Toronto.

Nipissing Copper and Silver Company, Ltd. Capital, $3,500,000, divided into three million five hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Fred. Asa Hall, Samuel Hugh Bradford and Solomon Joseph Marshalleck, all of Toronto.

Cobalt Silver Prince, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Cobalt, Ont. Provisional directors: S. D. Maddin, Cobalt, Ont.; D. Crawford and H. Campbell, New Liskeard, Ont.; H. H. Lang, Ottawa; Matthew Finn, Detroit, Mich.

The Lake Abittibi Gold Mining Company, Ltd. Capital, $200,000, divided into two thousand shares of one hundred dollars each. Head office, Toronto, Ont. Provisional directors: John Redmond Meredith, Matthew Crooks Cameron and Robert Stanley Waldie, all of Toronto.

Coleman and Quebec Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Ottawa. Provisional directors: Daniel O'Connor the Younger, Robert Masson, J. Wilson, Adam Tozeland Shillington and J. Ogle Carss, all of Ottawa.

Cobalt Silver Ores, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: James Russell Lovett Starr, James Houston Spence, Lilian Murray Heal, Ida May Duncan and Ida Agnes Rogers, all of Toronto.

Campbell-Crawford Cobalt Silver Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Provisional directors: M. Finn, Detroit, Mich.; D. Crawford and H. Campbell, Liskeard, Ont.; Eustace Craven Bowman, Detroit, H. H. Lang, Cobalt, Ont.

The Dufferin Cobalt Silver Mines Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Ottawa, Ont. Provisional directors: R. A. Helmer, J. E. Hutcheson, Ernest Arthur Larmouth, George Harold Craig and F. H. Honeywell, all of Ottawa.

Northland Mining Company, Ltd. Capital, $250,000, divided into two thousand five hundred shares of one hundred dollars each. Head office, London, Ont. Provisional directors: T. H. Smallman, John Smallman, Geo. Henry Ronalds Harris, and Emilia Archange Harris, all of London.

British American Cobalt Mines, Ltd. Capital, $3,000,000, divided into three million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: John Black, Cobalt; A. G. Fowler Ross, Montreal; Ziba Gallagher, Ethel Maud Wilson and J. S. Booth, all of Toronto.

Cobalt Bullion Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: A. T. Budd, Haileybury; H. P. Glidden, Cobalt; John MacKay, Renfrew; P. J. Montague and Frank Pottage, both of Toronto.

Penn Cobalt Mining Company, Ltd. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: James Edward Day, Edward Vincent O'Sullivan, Mary Donevan, Harry Jewell and James Henry Hallett, all of Toronto.

Banner Cobalt Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Windsor, Ont. Provisional directors: Robert Schulenburg, Merton Lawson Rice, Irving Wesley Green, Warner Raphael Thompson and Timese Lemay, all of Detroit, Mich.

Cobalt Silver Crown, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: John Walter McDonald, Gertrude Eleanor Cherpaw, Richard Stuart Dobbs Hartwick, Eva Lena Bradley and Thomas Brown, all of Toronto.

Pennsylvania Cobalt Silver Mines, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Eugene Van Portway, John George Adair, Emmett Ernest Gallagher, Eugene Coleman Spereman and Jeanette McKinnon, all of Toronto.

The Nepigon Mines Company, Ltd. Capital, $5,000,000, divided into five million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: J. H. Black and John Ferguson, North Bay, Ont.; L. P. Sandbach, Haileybury, Ont.; G. C. Campbell, New York; A. M. Wiley, Port Arthur, Ont.

Cobalt Mining Information Bureau, Ltd. Capital, $40,000, divided into eight hundred shares of fifty dollars each. Head office, Toronto, Ont. Provisional directors: George Fifield Morton, Alexander Hector Beaton, Emmett Ernest Gallagher, Eleanor Jane Potts and Jeanette McKinnon, all of Toronto.

Consolidated Cobalt Mines, Ltd. Capital, $2,000,000, divided into four hundred thousand shares of five dollars each. Head office, Toronto, Ont. Provisional directors: Harper Armstrong, Alexander Fasken, George Herbert Sedgewick, Archibald Thomas Struthers and William Henry Syms, all of Toronto.

Standard Cobalt Mines, Ltd. Capital, $2,000,000, divided into four hundred thousand shares of five dollars each. Head office, Toronto, Ont. Provisional directors: Harper Armstrong, Alexander Fasken, George Herbert Sedgewick, Archibald Thomas Struthers and William Henry Syms, all of Toronto.

Dardanelles (Larder Lake) Gold Mines, Ltd. Capital, $250,000, divided into two hundred and fifty thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Henry Stanyon, Frank Pottage, George Henry Shackleton, Bessie Mabel Cook and Frederick Napier Tennant, all of Toronto.

Freeda Larder Lake Gold Mining Company, Ltd. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: James Edward Day, John Michael Ferguson, Edward Vincent O'Sullivan, Arthur Winlow Bixel and Mary Donevan, all of Toronto.

Harris-Maxwell Gold Mining Company, Ltd. Capital, $100,000, divided into one hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Walter Robert Wakefield, Edward Wakefield, Homer Mason, Robert Paterson and Matthew Moore Hulse, all of Toronto Junction, Ont.

The Lumsden Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: John Inkermann MacCraken, Ottawa; Alexander Hector Beaton, Emmett Ernest Gallagher, Eleanor Jane Potts and Jeanette MacKinnon, all of Toronto.

The Esparanza-Cobalt Mines Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Windsor, Ont. Provisional directors: Walter Edward Parker, Frederick Sealy Osborne, Harry Bromfield Bennett, Adams Milton Holden and Benjamin Streeter Warren, all of Detroit, Michigan.

The Brooks Hudson Silver Mining Company, Ltd. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Head office, New Liskeard, Ont. Provisional directors: T. H. Brooks, C. H. Fullerton, John B. Stallwood, Murdoch McLeod, F. W. Haynes, New Liskeard, Ont.; W. G. Otto, Vars, Ont.

The National Cobalt Silver Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Provisional directors: William Gordon, Pembroke, Ont.; John Worthington Smith, Charles James Rattray, Bethune Norman Gordon, Larmouth and Godfrey, Benning Greene the Younger, all of Ottawa.

The Century Silver Mining Company, Ltd. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Sidmoor Sager, George Laws, Alexander Cook Hynd, John Courtland Haskell, Morley Oscar Barnard, Gaius Barrett Rich the Younger and John Andrew Rogers, all of Buffalo, N.Y.

Cobalt Lake Mining Company, Ltd. Capital, $5,000,000, divided into five million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Sir Henry Mill Pellatt, Norman Macrae, Britton Osler, George Charles Loveys, John Francis Hope McCarthy, Hugh Spence, Austin Gregory Ross, Molyneux Lockhart Gordon and James Miller Ewing, all of Toronto.

BRITISH COLUMBIA.

Chemainus Copper Mine Company, Limited. Capital, £200,000, divided into two hundred thousand shares of £1 each.

Old Dominion Copper Development Syndicate Company, Limited. Capital, $35,000, divided into thirty-five thousand shares of one dollar each.

The Bay Gold Mining Company, Limited. Capital, $200,000, divided into two hundred thousand shares of $1 each.

CATALOGUES.

The Sullivan Machinery Company, of Chicago, U.S.A., has issued a booklet descriptive of the Sullivan Air Compressors. It is well illustrated and affords an idea of the scale upon which the Sullivan Machine Company works. A fuller catalogue is also issued. One of these books will be sent on application to the nearest branch office of the company. These are situated at Claremont, N.H.; New York, 42 Broadway; Pittsburg, Pa., Farmers' Bank Building; Knoxville, Tenn., Houston Building; St. Louis, Mo., Missouri Trust Building; Joplin, Mo., corner 4th and Virginia Ave.; Denver, Col., 1748 Broadway; Salt Lake City, Utah, Keith Building; San Francisco, Cal.; Butte, Mont., 48 E. Broadway; El Paso, Texas, 209 St. Louis street; Paris, France, 25 Rue Raffet. Agencies in all mining centres.

We are in receipt of a report of the total output and value by states of the mineral products of the United States in 1905. It was compiled by Mr. Taylor Thorn, and was issued by the Department of the Interior, U. S. Geological Survey, Chas. D. Walcott, director.

Catalogue No. 26, "The Diamond Drill and Its Work," has been issued by the American Diamond Drill Company, P.O. Box 1442, New York, N.Y.

CALENDARS.

The Morris Machine Works of Baldwinsville, New York, have sent out one of the handsomest calendars of the year. It will particularly appeal to all who love horses and dogs.

F. H. Hopkins & Co. have sent to the Mining Review a particularly useful calendar. It is large and very clear; such a calendar, in fact, as every business man wishes to have hanging in his office.

We are in receipt of a calendar from Mussens, Limited, which, in addition to the usual information, carries some convincing illustrations of Bucyrus steam shovels, Vulcan locomotives, "Smith" concrete mixers, and other machinery for which Mussens, Limited, Montreal, are the agents.

There are calendars and calendars. A truly artistic one is generally hard to find, but those that Miss Graham, the head of the Ladies' Business College, 345 Temple Building, Montreal, is sending out, with her compliments, are about as dainty as anything we have seen. They carry a reproduction of a painting by the French artist Langee entitled "Harvest Days."

The B. Greening Wire Co., Ltd., of Hamilton, Ont., have favored us with their annual calendar. They write: "It is the usual design showing portraits of the president and incorporator of the present firm, the founder of the business here and the founder of the present firm in Warrington, England, where the late Benjamin Greening came from to start this business here.

"From the cut of the buildings our friends will see that there has been no growth this year, but from the plans being laid down at the present time there will be considerable increase during the coming year to take care of the increased volume of business that this firm is sharing with the rest of the manufacturers in Canada.

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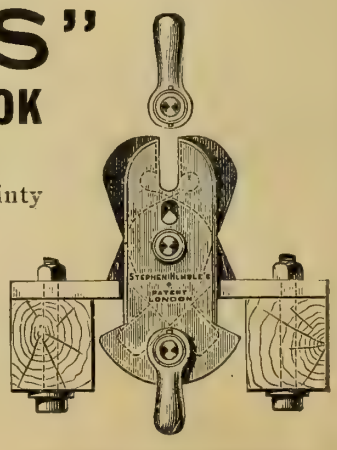
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EDITOR:
Charles A. Bramble.

SPECIAL CONTRIBUTORS.

NOVA SCOTIA:
Charles Fergie, M.E., Manager Dominion Coal Co., Ltd.
Graham Fraser, Sydney Mines, Cape Breton.
G. H. Duggan, Vice-President Dominion Coal Co., Glace Bay, C.B.

QUEBEC:
J. Obalski, Supt. of Mines, Province of Quebec.
Prof. Frank D. Adams, Professor of Geology, McGill University.
John E. Hardman, M.E., Montreal.

ONTARIO:
A. P. Low, B.Sc., R.G.S., Director, Geological Survey of Canada.
Thos. W. Gibson, Deputy-Minister of Mines, Ontario.
Dr. Alfred E. Barlow, Geolgical Survey of Canada.
W. G. Miller, Provincial Geologist, Ontario.
H. W. Hixon, Victoria Mines, Sudbury.

BRITISH COLUMBIA:
Arthur Wheeling, Jr., Vancouver.

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In his speech from the throne His Honour, Lieutenant-Governor Clark of Ontario, made the following reference to Ontario mining:—

The great value of the mineral deposits in the Cobalt district is becoming more and more evident and the future is full of promise both to the investor in mining properties and the people of the Province. The rights of the Province in these deposits have been kept steadily in view by my Ministers, and accordingly a measure providing for the taxation of mining properties will be submitted to you for consideration. I think it well to draw to your attention the fact that a tendency to hasty and reckless investment and speculation is abroad, and, it is to be hoped, will be kept in check by the good sense of our people.

The report of the Berry Creek Mining Company, Limited, of Victoria, B.C., for 1906, has been made public. This mine is situated in Cassiar Mining Division, British Columbia, reached by way of Wrangel, Alaska, and Telegraph Creek, B.C.

This new district was made famous in the '70s by the rush to Cassiar, when Dease, Thibert and McDame Creeks yielded $5,000,000 in placer gold. The British Columbia Mining Company has 10 hydraulic leases, 8,000 acres in all, fronting on Thibert Creek, 1,500 feet. From previous mining operations it had been learned that the average values of the ground since the company came into existence has been about 9¾ cents of gold to the cubic yard, from the top gravel, but when the bottom gravel was washed with the top gravel the average has been about 13 cents a cubic yard.

The conditions of mining at the end of last season's work were considered better than at any previous time. The paystreak shows for 1,100 feet, and it is estimated that there is in sight 400,000 cubic yards of material, having a value of from $50,000 to $55,000.

The most remarkable fact about the Berry Creek deposit is the large values in platinum, osmium and iridium. These have, heretofore, been going to

waste, but it is proposed to employ an expert this year to erect a plant that shall save a large percentage of the metals of the platinum group.

According to the Latchford correspondent of a Toronto paper, it is proposed to give transportation facilities to the new camp that will no doubt be developed this spring upon the Lady Evelyn River, through a line of steamers that is to run from Latchford with certain breaks to Sucker Gut. This would be very nice for Latchford if it should turn out to be feasible.

We have spent the better part of a summer upon these waters, and we are of the opinion that a line of steamers between Latchford and Lady Evelyn will not run for some years, if ever. It is hard work to take a canoe either up, or down, many of the rapids of the Montreal River. There are the Pork Rapids, at the head of Bay Lake, and then Mattawabika Falls, which, although not so high as Niagara, would be too formidable for a steamer to negotiate, and we hardly think it would pay to build locks as suggested, seeing that the river in so many places is hardly deep enough to carry a canoe. The way to take freight into the new camp would seem to be as follows: A line of small steamers at the head of the north-eastern arm of Timagami to Stoney Portage at the north end of the lake. Here a tramway could be installed and a small light draft steamer could carry the freight across Diamond Lake, whence a road or tramway, of about one mile and a half in length, would land cargoes at Lady Evelyn River at the very head of Sucker Gut.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY FOR 1906.

The issue of the Summary Report of the Geological Survey Department for the calendar year 1906 within two weeks of the close of the year is a matter of congratulation to the Hon. Mr. Templeman and to all concerned in the production of the report.

The value of this publication has been greatly enhanced by the insertion of a concise table of contents and an extended index by the use of which any reference to the mass of information contained in the report is easily found.

The report contains the Directors' statements regarding the work and administration of the Department, prominence being given to the efforts being made to increase the efficiency of the department, especially in regard to the early publication of the information collected by the different field parties; and attention is drawn to the great increase in the value of the mineral production of the Dominion during the past twenty years, from $10,221,000 in 1886 to $63,574,000 in 1905. During this period the aids towards mining given by the Dominion government as appropriations to the Geological Survey and the Mines Branch of the Department of the Interior have only increased from $115,055 to $173,555. The necessity of an increase of trained geologists to the staff is pointed out and the best method of procuring such officers is suggested.

A concise statement is given of the progress in the mining industries of the Dominion during 1906 which shows a healthy state of development throughout, owing to the enhanced prices of the metals and to the more economical methods of mining and smelting. The second part of the report deals with the work of the field parties under different officers of the department. These include the following:

Messrs. McConnell, Keele, Maclaren and O'Farrell engaged in the estimation of the value and volume of the Yukon gold-bearing gravels. Mr. Cairnes in examination of the mineral deposits of southern Yukon. Mr. LeRoy on the geology and economic minerals of the southern part of British Columbia along the Pacific coast. Mr. Leach on the important coal and copper areas of the Bulkley Valley, Skeena River. Mr. McConnell on a geological investigation of the Similkameen Valley in southern British Columbia. Messrs. Brock, Young and Boyd on an extensive study of Rossland camp. Mr. Dowling on the northern extension of the valuable coal beds in the Rocky Mountains. Dr. Chalmers and Prof. Macoun on the geology and soil along the line of the Grand Trunk Pacific railway in Saskatchewan and Alberta. Mr. Denis on the coal, oil and gas resources of Alberta and British Columbia. Messrs. McInnes and O'Sullivan on the geology and natural resources of the country on the proposed line of railway to Churchill on Hudson Bay. Mr. Ingall on the copper deposits of eastern Canada. Messrs. Collins and Wilson on portions of the country along the line of the National Transcontinental Railway in northern Ontario and Quebec. Dr. Bell on the Cobalt silver district. Dr. Barlow on the country east of Lake Timiskaming. Messrs. Johnston and Ellis on surveys in New Brunswick, and Messrs. Fletcher and Faribault on surveys in Nova Scotia.

These various reports, all of which are stuffed with facts, and many with information quite lately obtained, are condensed into one hundred and fifty-one pages and should go far to satisfying the mining community of all parts of the Dominion.

OUR CHIEF GEOLOGIST.

It is with much pleasure that we note that one of our best known geologists, a man who has been in the firing line for half a century, Dr. Robert Bell, F.R.S., Chief Geologist of the Canadian Survey, has been awarded the Cullom medal for the year 1906. The medal is given by the American Geographical Society, and this is the first time it

has been awarded to any other than an American citizen.

The prize is a magnificent gold medallion, purchased out of monies left by the late Gen. T. W. Cullom of the United States Army. His will directs that the prize be given annually to such as distinguish themselves by remarkable geographical discoveries, or by their labors in the advancement of geographical science. When of equal merit, citizens of the United States were to have the preference. It speaks well for the honesty and straightforwardness of the Council, that the necessary two-thirds vote was received by a Canadian geologist.

The American Geographical Society's headquarters are in New York. They occupy a very fine and commodious building on 81st street, in which are stored the Society's large and valuable library, collections of maps, charts, etc. The Society was incorporated in 1852, or fifty-five years ago, and it has always been the principal geographical society of the great Republic. It commenced, immediately, the publication of its monthly Journal, the name of which was changed at the end of fifty years to the Bulletin, which is one of the leading geographical periodicals of the world. The Hon. Charles P. Daly, LL.D., Chief Justice of the Court of Common Pleas of New York, and a devoted geographer, was continuously president of the society from 1864 till his death in September, 1899, a period of thirty-five years.

The American Geographical Society, in awarding the Cullom Gold Medal to Dr. Bell, has conferred on him a truly substantial honor, of which he may, indeed, be proud, but this is not the only conspicuous honor for geographical work which came to Dr. Bell in 1906. Earlier in the year, the Patron's Gold Medal, the chief prize of the other great geographical body of the world, namely, the Royal Geographical Society, was awarded to him by the unanimous vote of its council, and with the cordial approval of King Edward, who pays for the medal and also takes a great interest in its award and in the work of the society in general. At one of its meetings which he attended recently, upon the conclusion of the lecture of the evening, he reviewed the subject which had been treated of and moved a vote of thanks to the lecturer.

The Patron's or King's Medal, a beautiful work of art was founded when the society was first established, in 1830. Some of its recipients in the earlier days were Endersley, Burns, Chesney, Carl Ritter, Fitzroy, and later Sir George Nares, for geographical services in various parts of the world. Among those who have won the Patron's Medal for their explorations and surveys in North America were Thos. Simpson, Dr. Rae, Captain Back, John Ross, Captain Palliser, Sir Robert McClure and Sir Leopold McClintock. This medal or other awards of the Royal Geographical Society have been bestowed upon the more noted African explorers, such as Dr. Livingston, Captains Speke, Grant and Burton, Sir Samuel Baker and Sir Henry M. Stanley.

Dr. Bell has been fortunate in his opportunities for making extensive surveys of two kinds, the work having been done for the Government of old Canada, and since 1867 for the Dominion Government. The geographical part was done as being essential to the geological, which was the principal object. It is well known that the former has been much appreciated for many years, wherever geography is studied, but the latter has really been the more important service to Canada from a utilitarian or economic point of view, and it will be found to be of the highest value as the information acquired comes to be more and more needed in the progress of mining and practical geology in the Dominion.

TINSTONE IN CANADA.

Tinstone has at last been discovered in a solid vein in Canada. Samples were received at the end of last month by the Geological Survey from Mr. Harry Piers, curator of the provincial museum, at Halifax, and they proved on being assayed to be cassiterite, the most valuable of tin ores, containing 78 per cent. of tin and 22 per cent. oxygen. The discovery was made by Mr. John Keddy, at Lake Ramsay, on John Reeve's farm, three miles west of New Ross, Lunenburg County, N.S. The ore is found in semi-crystalline forms disseminated through a vein of decomposed, kaolinized pegmatite in granite.

As early as 1868 tin ore is reported by Prof. How to have been found in Nova Scotia in granite at Tangier and Shelburne, and latterly it has also been found in granite drift at Tangier and Country Harbour, and in the tailings at Malaga gold district. Still the granite rocks which form the backbone of the peninsula of Nova Scotia have always been regarded as barren of minerals of economic value by the prospector.

In 1903, Mr. E. R. Faribault, of the Geological Survey, examined geologically the New Ross region, and reported in the Summary Report for that year, the occurrence of ores of molybdenite, zinc, iron, manganese, copper, lead and silver, and other less important minerals, and he recommended the locality as a promising field for prospecting. In the Summary Report for 1906 a reference is again made to the ore-bearing character of the granites of that region and to the rumor of tin ore having been found at Lake Ramsay. Specimens brought then from that locality were examined for tin, but they only proved to be zinc blende, a mineral which much resembles cassiterite. The vein has only been opened 12 feet in depth and it requires to be developed considerably more to prove the economic value of the deposits. Still the fact is established that the granites of Nova Scotia contain valuable minerals, and chief amongst them is tinstone. More

exploratory work should be done in that region by panning for tinstone along the streams and developing the numerous pegmatite veins which cut the granite. In the reports of the Geological Survey tin ore is reported to have been found in drift at several places in Canada. It was found in New Brunswick on the Pokiok river, York county; in Quebec, on the sixth lot of the eleventh range of Whitton, Compton county; and in the gneiss of Buckingham, Labelle county; in Ontario in minute quantity at Sudbury, and the Vermillion mine, in the county of Denison, district of Algoma; in British Columbia in a three feet vein of pegmatite cutting granite near Osoyoos lake, also in Cariboo and Boundary Creek districts; and in the Yukon in several tributaries of the Klondike river, but so far, most frequently in Bonanza, Hunker and Sulphur creeks, where it occurs as stream tin in smooth rounded pebbles up to two inches in diameter, which remain with the gold in the sluice boxes, on account of their weight. The discovery of tinstone in the Laurentian rocks of Greenland constitutes a claim to attention in the fundamental strata of Baffinland where commercially valuable deposits may be expected.

Tinstone is a rare mineral all the world over, and has been found in paying quantities only in very few places, and generally in pegmatite veins in the granite. The world's output of tin in 1905 was 92,607 tons, produced by only six localities: the Malay peninsula producing 58,547 tons, or 60 per cent. of the whole. Bolivia, 12,500 tons, Billiton and Banka Islands in the Dutch East Indies, 12,615; Australia, 5,028, and England, 3,857 tons. In the United States tin ore was found in several states, including Maine, New Hampshire and Massachusetts, where it occurs in granite much similar to that of Nova Scotia, but not in paying quantities. No tin was produced in the United States before 1903; in that year nineteen tons of high grade concentrates were extracted from South Carolina and shipped to England; in 1904 about 142 tons of concentrates from South Carolina, South Dakota and Alaska were shipped to England, but no production is reported for 1905.

The price of tin has increased greatly during the last few years, and as the demand is greater than the supply it will certainly keep on increasing. In 1905 the price per pound increased from twenty-nine cents to thirty-five cents; in April, 1906, it reached 38.6 cents, and at present it is forty-two cents. The high price of tin is naturally stimulating developments in all parts of the world, especially in Australia and Bolivia. The cost of production has increased in the Malay peninsula on account of the exhaustion of the richer and more easily worked alluvial deposits, and also on account of the rise in wages.

Mr. Faribault will be in Nova Scotia again next summer to complete the geological survey of the gold-bearing and granite rocks lying to the west of Halifax in Lunenburg County, and will devote some time to a study of the mode of occurrence of the mineral veins at New Ross, so as to assist if possible in the development of this promising new district.

THE SOUTHERN YUKON.

Until recently it has been generally supposed that the mineral wealth of the Yukon existed entirely in its placer deposits, and as these are mostly in the northern part of the territory, the southern part was considered of little value. The days of the individual placer miners appears to be almost a thing of the past, as none of the fabulously rich deposits such as caused the early Klondike excitements have recently been found, and the work of washing the sands and gravels is now chiefly carried on by large concerns, so the life of the Yukon, to some, appeared to be measured by the life of the gold sands to the north. However, quartz mining has recently become of such importance and promise as to practically dispel this former idea.

To reach this country the usual route is to go by boat from Vancouver or Seattle to Skagway, Alaska, a distance of about 865 or 1,000 miles, respectively, thence via the W. P. and Y. Railway to Whitehorse, Yukon, a distance of 111 miles. From here steamers run down the river to Dawson, about 460 miles.

A few years ago a number of copper claims were staked just west of Whitehorse and some very encouraging development work was accomplished, but for a number of reasons the camp has been, until this last season, practically at a standstill. A few trial shipments of about ten tons of ore were made. Three such samples from the Copper King gave returns of 46 per cent., 31 per cent. and 29 per cent. copper, and there appears to be plenty such ore. This last season, Byron N. White, of Spokane, commenced work on the "Pueblo" and by surface stripping uncovered a body of almost solid ore about 270 by 250 feet, and a shaft was sunk in one place over 100 feet, and neither wall had at this time yet been found. The ore is hematite iron strongly impregnated with copper. The whole deposit seen would average at least 4 per cent. copper, and carries some gold values, and by hand sorting very high grade shipments could be made. The contact along which the copper properties are located can be traced over fourteen miles, and is mineralized throughout the entire distance.

With this exception no quartz mining, except a few assessments done by prospectors in different places, had been done in this southern Yukon until about a year ago this last summer, when Col. J. H. Conrad commenced work on a number of properties in the Windy Arm district, which is along the railway, and about forty miles south of Whitehorse.

Since then considerable development work has been done on a number of properties both by the Conrad Consolidated and the Anglo-American companies. The ores consist chiefly of high grade silver minerals and gold in quartz veins, which are in true fissures, and vary from a few inches in width to over twenty feet. Argentiferous galena is the chief mineral, often associated with rich silver minerals, such as argentite, ruby silver, and stephtanite, and accompanied by pyrite and arsenopyrite.

The Conrad Consolidated has three Riblet aerial tramways in operation for carrying the ores of the different properties to the shores of Windy Arm, the longest being 18,697 feet in length, with its upper terminal 3,469 feet above the lower, cost over $90,000 to install. The others are much shorter.

Some shipments of ore have been made, but these were mostly trial shipments. The properties are as yet in the prospect stage, but for the amount of work done look very promising.

The success of the Windy Arm properties encouraged prospectors to prospect more carefully this season, with the result that a number of valuable finds have been made. About the middle of June quartz carrying free gold and telluride minerals was found between the Watson and Wheaton rivers, about eighteen miles southwest of Robinson Siding. These quart veins were traced in a belt about two miles wide for about twenty miles in a southeasterly direction, and, over seven hundred locations were made. The quartz is quite well mineralized in places, carrying gold and silver values chiefly. However, no work has been done as yet to see what values the veins really carry. The telluride ores from the original discovery on Gold Hill assayed into thousands of dollars per ton, but only a small amount of this was found. The average surface assays which were made in the district were, however, encouraging.

A large body of stibnite carrying mercury was also discovered towards the end of the season, to the west of the other properties.

So considering that there were only a few men in the country and these were only prospecting a very short time, the results go to show over what wide areas the valuable ore deposits of the Yukon are distributed.

Added to this there is plenty of coal in the district. Quite an extensive basin of anthracite coal lies just to the south of the Whitehorse copper deposits, and is easily accessible from the railway. Also coal is being mined down the river north from Whitehorse in different places, and will probably be found much closer to Whitehorse. The samples taken from Tantalus and Five Fingers mines gives in the laboratory a good firm coherent coke. So that a smelter at Whitehorse, to treat the copper ores there, is one of the probabilities in the very near future, as there is plenty of water power in the vicinity.

OUR MINING INDUSTRY IN 1906.

The Director of the Geological Survey has introduced into his summary report for 1906 a new feature which will appeal to all those interested in the mining industry of this country. In a few words he sums up the principal items of the mineral production and shows that the mining industry has never yet been in so healthy a condition. He writes, "It can be said without fear of exaggeration that the condition of the mining industry in Canada in 1906 has been one of large prosperity, that it has, in fact, achieved greater progress and given bigger returns than during any previous year on record. In the year 1905 the total mineral output reached almost $70,000,000, as compared with but a little over $60,000,000 in 1904, and while actual figures of production are not yet available for 1906, the activity evidenced in both the metalliferous and non-metalliferous mining will, no doubt, result in another large increase being shown. There has been during the year an active demand for nearly all mining products, and the higher prices realized, especially for the metals and their ores, has not only helped to increase the actual output, but have stimulated development and prospecting throughout the country.

Metallic.—The increase in prices of metals during 1906 is distinctly shown by the following quotations. The average price of the metals for 1905 was as follows: Silver, 60.35 cents per ounce; copper, 15.59 cents per pound; lead, 4.7 cents per pound; spelter, 5.82 cents per pound; nickel, 40 cents per pound. During 1906 the prices of all these metals had increased, and in December, 1906, the quotations were as follows: Silver over 70 cents per ounce; copper, over 22 cents per pound; lead, 5.75 cents per pound; spelter, 6.4 cents per pound; and nickel from 45 to 50 cents per pound.

Nickel.—The nickel-copper mines at Sudbury have been actively worked throughout the year and will show an increased output. Electric power has been introduced and the general efficiency of the works greatly improved.

Copper.—The actual output of copper in eastern Canada, outside of the metal obtained from the nickel ores above mentioned, is comparatively small, but a great deal of work has been done during the year in the exploration and development of copper properties.

British Columbia is now Canada's great copper-producing province and more particularly the great bodies of low grade, but easily mined, ores of the Boundary district. The shipments from this district during ten months of 1906 are estimated at close on a million tons or greater than the total output of 1905. The smelting capacity of three furnaces in the district was considerably increased during the year. Dividends were declared by one company aggregating $1,215,000.

The copper mines of the Coast district in this province have been actively worked during the year,

as were also in the ores of the Rossland district, which are further mentioned under the heading "Gold."

Gold.—The gold output in Canada has been showing a yearly decrease since 1900 due to a regular falling off in the Yukon placer production, and this decrease has, in all probability, continued in 1906. In eastern Canada the output has never been large, but Nova Scotia seems to make a better showing in 1906 than in the immediately preceding years. In British Columbia the gold production has shown a slow but steady increase which has to some extent counterbalanced the decrease in the Yukon output. In Rossland an important amalgamation of interests took place in the early part of the year. The War Eagle and Centre Star mines, the smelting works of Trail, with the St. Eugene silver-lead mines of East Kootenay, and other interests, were united under one management known as the Consolidated Mining and Smelting Company of Canada. The consolidation is one which will, no doubt, tend to much greater stability in the mining industry.

The discovery of new ore shoots in the Centre Star and other mines, the payment of dividends by the Le Roi, the Le Roi No. 2, and the Consolidated Mining and Smelting Company, and the encouraging detailed geological work done by the Geological Survey under Mr. Brock, have all tended to put new life into the district and a bright future is looked forward to. The total ore shipments for 1906 may possibly not exceed or even equal those of 1905 owing to the unfortunate strike of coal miners at Fernie having caused the smelters to close down for some months in the latter part of the year for want of coke.

In Cariboo several properties, including that of the celebrated Consolidated Cariboo Hydraulic Mining Company, were acquired by the Guggenheim Exploration Company, and a large investment of capital is being made in the construction of many miles of new ditches, which will supply a more regular and larger supply of water for the working of the huge areas of gold-bearing gravels this company possesses.

The Atlin placer deposits were worked about as usual, although a shortage of water had to be contended with.

The gold output of the Yukon will again apparently show a decrease. Official figures are not yet available, but from current reports apparently not more than $6,000,000 is to be expected this year. In this district the large corporations are absorbing the smaller operators and the Guggenheim Exploration Company under the name of the Yukon Consolidated Gold Fields Company has entered the field buying up numerous claims. The company has already commenced the construction of ditches and flumes to provide water for operating their claims. Other large work are to be undertaken, such as the construction of reservoirs, a power plant, etc., and altogether a large number of men will be employed this winter.

Iron.—The iron industry has been active throughout the year, a good demand for all classes of iron products having been experienced and the iron furnaces have been operated probably more extensively than ever before. A new furnace plant is in course of erection at Port Arthur intended to utilize the ores of the Atikokan areas. The output of pig is likely to be larger than in 1905, and would probably have been still greater but for an unfortunate dispute between the Dominion Iron and Steel Company and the Dominion Coal Company in November regarding their coal contract.

Lead and Silver.—The argentiferous galenas of the Kootenay districts are again being worked on a large scale, the East Kootenay mines, St. Eugene and others, being large shippers during 1906.

The Cobalt district of Ontario has attracted world wide attention during the year and is rapidly becoming an important silver producing district.

Zinc.—The concentrating of zinc ores in British Columbia has continued with considerable success. The large zinc smelter at Frank, Alta., was sufficiently advanced for the first metal to be turned out in June. It is understood, however, that some further changes and improvements were found necessary before regular smelting could be undertaken.

Non-metallic.—Amongst the non-metallic class of minerals mined in Canada, the more important are mica, chromite, coal, corundum, gypsum, mica natural gas, petroleum and salt, besides the structural materials including the clay products, stone and lime and cement. The mining of all these products and others of lesser importance has actively progressed during the year. The coal mining industry especially has made good progress in the various fields exploited, Nova Scotia, Alberta and Saskatchewan and the Crowsnest Pass and Vancouver Island fields of British Columbia. In Alberta a rapidly growing population has created such a demand for coal that new mines are yearly opened up and a much larger output made. Nearly one-half the coal mined at the Crowsnest Pass is converted into coke to supply the rapidly growing demands of the smelting industry in British Columbia and for export. Labor difficulties have interfered to some extent with the operations at Fernie and at Lethbridge, the latter causing a shortage of coal at certain points in Saskatchewan which threatened to become serious. These difficulties have, however, been happily settled before the close of the year and no doubt in time to avoid any further serious trouble.

The asbestos mining in the eastern townships of Quebec has been particularly active during the year, prices have been good and a large increase in mill capacity to handle the mineral is contemplated.

The chromite ores of this district have also been mined about as usual.

Gypsum mining in Nova Scotia and New Brunswick and to a lesser extent in Ontario and in Manitoba has been carried on with increased output. Higher prices have also been obtained in this industry.

The corundum of Ontario finds a ready market; mica has been in good demand and at higher prices, while natural gas, petroleum and salt industries of the Ontario peninsula have been worked as usual.

In the structural material class the production of clay products such as bricks, tiles, etc., stone and lime, has to keep pace with the growth of the population. The increased use of cement in all kinds of structural work such as buildings, sidewalks, and roadwork, bridges and monolithic work, etc., has caused a great demand for this product and a largely increased output is being made.

CONCENTRATION.*

Since the world became highly civilized, there have been eras, or ages, when some one great industry has flourished to a much greater extent than the rest during that period, such conditions lasting, perhaps, for several decades and even centuries. The present age might appropriately be called the age of mining. At no previous time in the history of the world has the mining industry taken such a strong hold on the people as at present. Mining in nearly every civilized country has forged to the front with great rapidity. New discoveries are being made every day, and new concentration, or reduction, plants installed.

Canada, as we are all convinced now, is a country of great mining possibilities. Events are transpiring from day to day which demonstrate, as Dr. Adams has pointed out, that we have scratched or prospected only a very small percentage of the great territory allotted to us for exploration, and that we may reasonably expect such great and almost bewildering discoveries, as the world has never yet witnessed. But, right here, another aspect of the subject presents itself, and this may be best put into the form of the following questions. Are we aware that many ore deposits, of various natures, whose existence has been known to us for years, have not been developed, nor has there been any attempt made to make them economically useful? Do we realize that with the progress of technical science we are able, to-day, to treat ores more successfully than ten or twenty years ago? That we now can make mines pay, which could not be put on a paying basis years ago, on account of the lack of knowledge of proper methods of treatment?

Gentlemen, it would appear from these questions that I find fault with the craving of the general public for something new, before they have taken advantage, fully, of these dormant things lying at our threshold waiting utilization! No; far from it. New mineral discoveries are needed to draw the attention of foreigners, and of foreign capital to this country—Canada in the first place needs a denser population, and, so far as I can judge, we need more foreign capital with which to develop our resources. But it often happens, that just such capital, originally intended for investment in new discoveries, has, for some reason or another, been applied to the development of mineral resources of this country, known for some time, but which on account of expensive methods of separation could not in the past be made to pay.

Here then, logically, another question arises: What constitutes the success of a mine? What are the essential factors which make up the successful mining venture? Gentlemen, to answer this question would require a long dissertation on a subject which lies beyond the scope of this paper. First and foremost, there is required a study of the geology of the ore deposits—a branch of science which has been greatly developed during recent years. To cite only one example of how this enters into practice; it may be remarked that thousands of dollars expended in the fruitless prospecting of twenty years ago, would have been saved, if there had then been the knowledge of secondary enrichment that there is to-day. Next comes the matter of the tonnage, and in the case of metalliferous ores, the assay of the ore developed. Of great importance are the conditions governing the extraction of the ore, and the cost of mining. And last, but not least, the question of the treatment of the ore—its economic separation from the accompanying gangue material. It is upon this latter subject that I should like to say a few words to you, gentlemen, especially to the younger members of my audience, and I feel confident that you, after careful consideration, will find my remarks, based as they are on personal observation in the field, to be not far from the mark.

The mining engineer of to-day requires not only a broad knowledge of the geological conditions which govern the mineral deposits, not only a knowledge of the ways and means of getting out the ore, but he requires also a deep knowledge of the problems of separation. How many mines have been doomed to failure through the absence of just such knowledge? The profession of mining engineering presupposes, nowadays, a very broad knowledge of the principles which govern modern ore separation. Twenty years ago we may say that ore separation was simply in its infancy; a time when it was believed that simply cobbing the ore, or putting it through a crusher and treating it by the wet process, was perhaps enough for so-called rough treatment, and when no further utilization of the residue was deemed necessary. But, to-day, with the great advance in technical science, with progress in all branches of industry, these old processes are found insufficient, and to our great

* Address delivered before the Mining Society of McGill University by Mr. Fritz Cirkel, M.E., Montreal.

satisfaction we find that mining engineers have not been idle in extending and improving the processes in vogue, in fact, old-fashioned separation methods have been succeeded by others that make it possible for a mine to pay dividends which could not have been worked at a profit by old methods.

But, gentlemen, we must not stop here. We must not think there has been such progress that we may now treat all kinds of ore with success. On the contrary, new ores of complex composition, are found each day, and which require special treatment, though the principles involved may be in all cases identical.

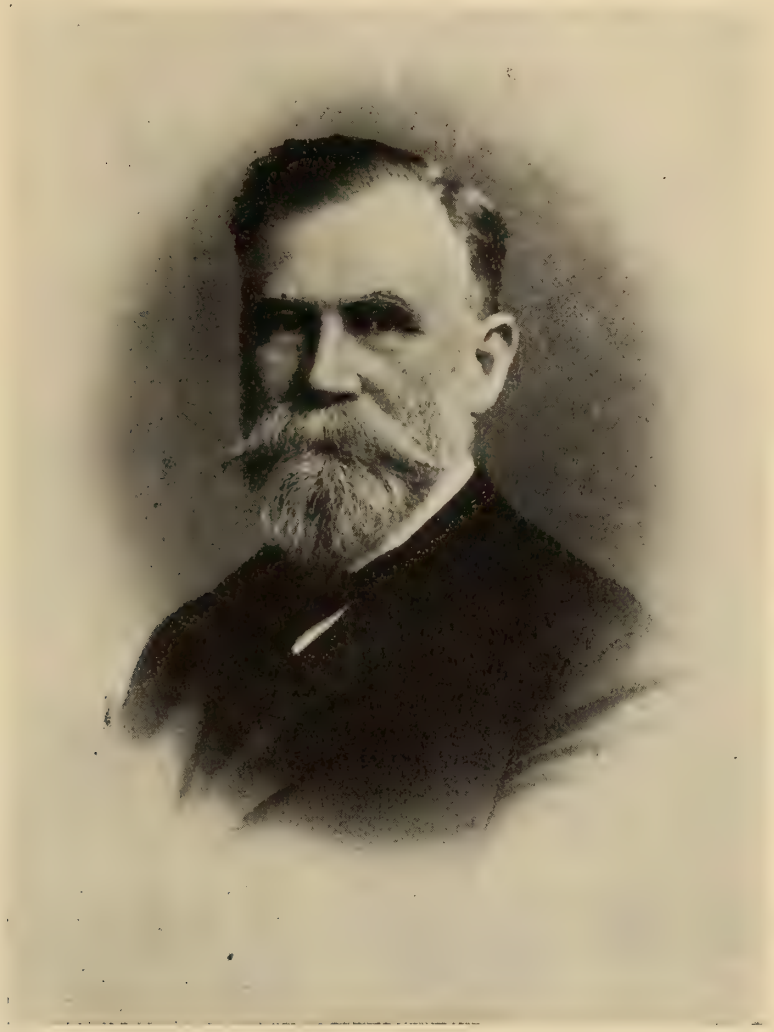
Take gold, for instance, We all know that some twenty years ago the only way of extracting gold from its matrix was by the well known amalgamation process, which was, with here and there slight variations, applied to all free milling gold ores. We remember, also, that twenty years ago great excitement was caused by the invention of the cyanide process. Now, from the success this process has attained treating Transvaal ores, as well as those of California, it would seem that nearly all gold ores could be amenable to this process with slight variations. But this we know is not the case. A further development was registered by the application of the Pellatin-Clerici process, an electric process, for which it was claimed, that all gold occurring even in a very fine state of division could be extracted. Yet, although this process was successfully applied to a number of ores, still there are gold ores which do not seem to be attacked successfully by any process in vogue. I have a case in mind, where ores which contain the gold in a very fine state of division, were treated with this process, and the result was that fully 45 per cent. of all the gold was lost. Another case, which will illustrate the necessity of continuous experimentation with one's ore, is one which came under my attention some eight years ago, in the State of Washington. This mine when I made the examination, had, approximately, 100,000 tons of gold ore in sight, averaging eleven dollars in gold to the ton. A mill was built for the treatment of the ore at an expense of $60,000, but, although great efforts were made to bring the enterprise to a successful issue, it was doomed to failure, owing to the impossibility of getting a satisfactory extraction of the values. This mine, although having a very large tonnage of ore in sight, has been lying idle ever since. Here, gentlemen, is an example of a case where ingenuity can make its mark; here is a case which demonstrates that we have not yet solved the problem of gold extraction in all cases, and it is for the engineer, and for the chemist to work hand in hand for the discovery of such treatment as may deal with ores in which the gold is in an extremely fine state of division. Here, is a case where a fortune awaits the engineer or chemist, who will solve an intricate problem of gold extraction.

I will deal, now, with another ore, which is the mainstay, the backbone and foundation of the wealth of a nation; iron. You know that we find iron deposits through the Laurentian formation. A number of deposits were worked some thirty or forty years ago, and although the mines offered great inducements as regards tonnage in sight, the operations were not successful. What was the cause? Was it the composition of the ore, which prevented it from being used successfully in the furnace? No, it was, simply, the lack of proper separation of the ore from the gangue. But it is with satisfaction we find that since that time processes have been invented which facilitate the concentration and handling of such ores. Magnetic ores, in nearly all cases, are more or less mixed with the rock of the containing formation, and it would be an immense task to separate the ore from the gangue by hand. However, magnetic concentration comes to our aid, and ores which have only a percentage of 23 per cent. can be made use of by concentration. I may add that in the great concentration plants in the Adirondacks, magnetic concentration is in vogue, and the mines, through this process alone, have been made an unqualified success, and put on a paying basis.

From an examination of the iron ore deposits in Ottawa County, I am convinced that our magnetic mines can be put on a paying basis, by just such a system of magnetic concentration, and it is not unlikely that an American firm, which has been conducting diamond drill operations in some of the mines, will put up a large concentration plant, and work the mines to their full capacity.

From what I have said, gentlemen, you may easily infer that here is another case, where there is sufficient ore in sight, but where there has been no mechanical means whereby the ore might be treated, so that it was acceptable to the market. John Stuart Mill says: "To draw inferences is the great business of life."

I may quote another example of my meaning—asbestos. You know that Canada supplies the whole world with asbestos, but this would not be so were it not for the processes of separation which have been invented to extract the fibre from the gangue. The history of this mineral makes interesting reading. Mining operations in the Eastern Townships of Quebec commenced on a small scale in 1878, and in that year 50 tons were taken out for which, however, it was difficult to find a market. The quality of the fibre was excellent, and the width of the veins was everything that could be desired, from 1 inch up to 2, 3 and sometimes 4 inches. This justified the expectation that large deposits of the mineral might exist in that locality, though their true importance and value were not ascertained until several years later. Shipments of the better grades made to London created quite a sensation in the market; extensive tests and investigations were



DR. ROBERT BELL, F.R.S.,
Chief Geologist.

made, and the result was that the high value of this mineral on account of its exceptional qualities for spinning purposes was soon established, and the race for the acquisition of additional areas likely to contain the valuable mineral began. The land was considered practically of very little value for agricultural or any other purpose, and mining operations were rapidly extended.

For the next ten years we witness a rapid development of the industry. The mines are worked on a large scale, while the prospector is still busy exploring for the mineral in the surrounding mountains. Villages spring up like mushrooms, in a country which is physically speaking, one of the roughest. The population, comprising before the begining of mining operations, only a few scattered families, increases to several thousands, and the whole country shows all the evidences of industrial activity and prosperity.

But it was soon discovered that the primitive methods of hand extraction were faulty, inadequate and expensive, especially as far as the lower grades were concerned. As a matter of fact, under prevailing price conditions, only those mines which were working on richer ground, and had a large percentage of crude asbestos, had a chance to live and carry on operations with a profit. The natural outcome of this condition was obvious; many mines producing only a very small percentage of the higher grades were forced to shut down, and this, together with serious difficulties accentuated by overproduction and a consequent fall in prices, caused the industry to receive a severe set back in the middle of the nineties. For some years the industry languished, all retiring save those who would not be discouraged, no matter what should happen.

However, the mechanical ingenuity of those engaged in the mines, and of those having the development of the industry at heart, came to the rescue; handcobbing of the lower classes of asbestos gave way gradually to mechanical treatment, and this method, in the course of years, was so successfully and effectively worked out that, to-day, we find every mine in the district with a complete milling and fiberizing plant. By this process, all the smaller fibre, which in the earlier years was left in the rock, and thrown on the dump, is saved, and as new uses for this short material sprang up, the life of a mine was prolonged and its management attended with less difficulty.

As a result of these innovations, 16 mills with a capacity of 3,500 tons of asbestos rock per day, are operating in the district, and if reports prove true, the capacity of the mines and mills will be largely increased during the present year.

The asbestos industry is a striking example of what human ingenuity, if applied in the right direction, may accomplish. It demonstrates that, in order to atttain success, it is necessary "To strive, to seek, to find and not to yield."

The asbestos mines of the Eastern Townships constitute one of the most prosperous industries of the Dominion of Canada, and they are of special interest to the mining and industrial world, from the fact that, in so far as now known, they represent practically the only deposits where this mineral of a quality adapted for spinning and for the finer purposes of manufacture can be mined with a profit. So great are the advantages which these mines possess, particularly as regards accessibility and the ease with which the extraction of the fibre is now accomplished in the mills that, unless fields as yet unknown and as easy of access can be discovered, the Province of Quebec will long enjoy the privilege of being the principal source of supply of asbestos, not only of the North American continent, but of the world.

I have another case in mind; graphite. Canada has been known for over 50 years to possess rich deposits of this mineral in the Laurentian formation. But what have we to show in the way of a graphite industry, in the way of development of our mines, or of concentration plants? Surely, not much up to this time. The statistics tell us the yearly production amounts to only a few thousand dollars. But there seems to be to-day a better appreciation of our graphite resources, especially by foreigners, and this, going hand in hand with great improvements in concentration will, undoubtedly, result in the establishment of a solid graphite industry.

The general public nowadays is apt too much to live under illusions of prospects of great wealth; they invest blindly in mining ventures where according to their opinion great wealth awaits them, or is, at least, bound to come by persistently putting holes in the ground. As a rule, they consider mining as a gamble, and not as a legitimate business as in any other walks of life. They flee the practical miner who offers a mine abounding in low priced ores; but they listen attentively to the promoter with his fairy tales of fabulous silver finds in the Cobalt district, who will eventually do "mining" himself—not in Cobalt but in the pockets of the public. What is the result? The resources of the lesser minerals lie dormant and are not developed. I have a case in mind where large tracts of graphite lands, with numerous outcrops of fine flake graphite could not find a buyer for years, until American capitalists took hold of them recently. They, by further exploration work, found that the ore bodies were of such large extent that now two graphite separation plants are in course of construction, and over one million dollars has thus been invested in the last two years.

It is gratifying to know that American capitalists are now taking a hand in the development of these resources. They have not been slow in recognizing the great value of these deposits; and that is not all—they have also realized the great value of concentration in making the mineral marketable,

and here—I venture to say—lies the secret of success in the case of graphite mining.

I trust I may be permitted here to discuss some of the principal causes which retarded measurably the healthy progress of this industry. The graphite ores of even the same composition cannot always be treated by similar methods, on account of the different physical characteristics of the mineral occurrences. This difficulty is apparent in the case of ores containing flake graphite, as well as in those containing only dense or amorphous graphite. Both of these ores occur in some localities in gniess, but it would be futile to attempt to apply a process, which gives perhaps good results in the separation of these ores occur in some localities in gneiss, but is even more complicated, when ores containing both varieties are to be treated.

Another difficulty arises from the fact, that in some localities the gangue, accompanying the mineral, is found to change as development proceeds, and it must be said, that this is one of the principal sources of difficulties in the construction, operation and adjustment of graphite mills. The selection of one or the other method is very often based on guess work, and with very little regard to what the general "run of mine" is likely to be. When a deposit of graphite is discovered, a number of test holes are sunk, as a rule, to determine the character of the ore, or to trace the ore lode on the surface; where the ore appears to be of satisfactory quality and quantity, larger excavations are made, or a shaft is sunk, or a tunnel is run, following the trend of the ore body, and in the majority of cases, where quick returns are essential for the continuation of the enterprise, the construction of a mill for the treatment of the ore is proceeded with, based on preliminary tests with ore generally taken from chutes, which promise to deliver the bulk of the material to be treated. Very often, however, it is found in the further development of the mine, especially in the crystalline formations that the ore changes in character, both physically and mineralogically. That, for instance, an ore originally flaky turns into one that is both flaky and amorphous; that, further, the gangue with the accessory minerals change, and so on, and the result is that the mill which was originally laid out and constructed to suit a specific class of ore has now to treat an entirely different one. A series of experiments then demonstrate, that the arrangement of the apparatus and perhaps these themselves have also, to be changed, in order to meet these new conditions; sometimes an entirely new system has to be adopted, which in the majority of cases can only be done by spending a large amount of money.

The author has a case in mind, where a property was superficially tested and found to contain flake graphite in quartz. Before proceeding with the development of the mine, to determine the extent of the ore body and its character, a mill for the treatment of the ore was erected. In developing this mine, however, it was discovered, that the contents of flake diminished, and that, instead, amorphous graphite appeared. That, further, the gangue changed from quartz into pure calcite. The consequences were obvious. Change after change had to be made in the mill in order to meet new conditions arising solely out of the development of the mine, but with little success, until it seemed inadvisable to alter the existing milling process. The construction of an entirely new mill was the only remedy, but the financial resources being exhausted mill and mine were shut down.

We learn from this example, that the construction of a mill to treat the ores of a mine should only be proceeded with, when all the conditions, the character of the ore, as well as the extent of the ore body, are fully known, and this can only be attained, if the mine is developed properly, the stopes laid open, and the different ore shutes thoroughly tested as to their contents in useful and waste material. Until such is the case experiments on a large scale with the ore should be deferred, the preliminary outlay for opening up the mine is insignificant compared with the large expenditure, to say nothing of the trouble and annoyance, resulting from the premature erection of a milling plant, with a system based upon guesswork, hasty judgment, and insufficient knowledge of the conditions really existing in the mine.

Mechanical ore separation is an ancient art, but during the last ten years it has experienced some remarkable improvements. These have revolutionized the practice of ore dressing in general; it appears, probable, that there will be still further innovations, of a character not yet clearly foreseen, except by some inventors who are working on special lines. Even as recently as five years ago there were practically no methods of mechanical separation, except hand sorting, jigging and washing on tables, and magnetic separation, the last method having only a very limited application. Since then radically new processes, such as electrostatic separation, oil concentration and the flotation of minerals in certain baths have been discovered. In these ways it has become possible to separate a wide range of minerals of close specific gravity, that cannot be separated by jigging or slime washing. Similarly, it has been demonstrated, that phosphate can be separated from hornblende, the difference in specific gravity being only 0.35, further molybdenite, monazite and other rare minerls, can be separated from their gangue, which it is often difficult to do by ordinary gravity concentration. Experiments have shown that graphite may be separated electrostatically from its gangue, and it is not unlikely that such a process will be developed commercially before long. These experiments have been, to a certain degree, successful, and, it may only be a question of time and of some improvements, before a

complete success is attained. It may be of interest to quote the following note from W. R. Ingalls* on general ore separation: "Probably few realize the probable extent of development, which they will experience during the next ten years, or what results may be achieved by them. It is quite certain that no single process is a universal panacea for all the difficult problems of ore treatment. For certain ores one process is best adapted; for other ores another process. For still other ores the best results may be achieved by a combination of two, or three, or even more of the special processes. This is a direction of effort, that has not yet received very much attention. It will be, however, the logical result when the design of such ore dressing plants passes out of the hands of the promoters of special processes into those of the engineer, who is retained by his clients to secure the best results."

Gentlemen, I trust that you have fully understood the purpose of my paper. I have drawn your attention to the fact that good mining engineering besides geology, mechanical engineering and surveying, requires also a thorough knowledge of the principles of ore separation. It is often asserted that in order to make this or that ore marketable, it is only necessary to write to an engineering firm, who will put up the concentration plants at a contract price. This procedure is as stupid as it is unbusiness like. Each firm has certain special machinery to sell, which might work in a satisfactory way, on a specific mineral of a certain chemical composition or physical qualities; but these machines do not give satisfaction on every ore. Generalizations on this subject are entirely impossible, and it is the engineer in charge upon whom falls the task of devising such apparatus, or of making such combinations of known apparatus as will enable him to make the best extraction of his ore. It is when face to face with cases of this kind that the mining engineer can show of what stuff he is made; whether he has fully grasped the value and applicability of general concentration principles.

Many a mining enterprise has been doomed to failure because the party at its head had no knowledge of the theory and practice of the separation and classification of ores. It is not sufficient for an engineer to know whether this rock is a granite, or that one a diorite; it is not sufficient to unearth hidden treasure and bring it to the light of day; no, in ninety out of a hundred cases, the real work and trouble begins with the preparation of the ore for the market. It is all very well to dig out silver by the bushel as they do in some of the Cobalt mines. These mines are exceptions to the rule, and they form only a very minute percentage of the working mines. Gentlemen,—and I mean specially those young fellows who are preparing for the difficult task of the mining engineer,—only a few of you will have the pleasure of becoming the leading spirit of a mining enterprise, where there is abundance of rich ore, and where there is perhaps no difficulty in marketing whatever you get out of the mine. But, I venture to say, that most of you in the course of your professional career, will have to confront other more serious problems, some of which will tax not only your knowledge of concentration but also your resourcefulness. You may be called upon some day by people who put unlimited confidence in your ability, to take your place at the head of a large mining enterprise, to answer the fundamental questions which determine the value of a property: How much will it pay? How long will it pay? And how much will it cost?

Gentlemen, I think I have already taken up too much of your time, yet in conclusion may I be permitted to say one word more: Do not neglect the study of the fundamental principles of ore separation and classification.

I trust that I have shown you in the examples I have mentioned why you should devote much of your time to these subjects. You enjoy such great facilities here in McGill University, that I should think you would find no trouble, whatsoever, in making yourselves acquainted with the subject under discussion. You have all the important machines that are used in concentration, and on which you can study at your leisure the principles involved, and in this respect, McGill is far ahead of any other institution of a similar nature. I remember that, when I was studying at the Academy at Aachen, Germany, our mining professor explained the working mechanism of various apparatus by small models, which were supposed to be true copies, and that we never had the opportunity—as you gentlemen have here in this institution—to put these to practical tests. I must congratulate you upon the splendid equipment of your mining laboratory and concentration plant; but this is simply due to the untiring efforts of Dr. Bonsall Porter.

* "Engineering and Mining Journal," 1905, to page 643.

CLAY AND THE CLAY INDUSTRY IN ONTARIO.

By W. G. M.

The more stable but more prosaic mineral industries of a country are apt to be neglected somewhat for those which appeal more strongly to men's imagination or cupidity The clay working industry, which next to agriculture, can be called the most ancient of industries, has up to the present been almost neglected by scientific workers, although during late years in Germany, the United States, and in other countries, it has been receiving more attention. Several of the States of the American Union, and other countries, now have departments devoted to the study of clay and its products. In Ontario the clay industry has grown rapidly during

recent years. Brick, being cheaper than stone, is being used in modern cities in place of wood on account of fire protection purposes. As years go on, the clay industry must become proportionately more important. It is well, therefore, at this time, for Ontario to have a systematic report such as that of Mr. M. B. Baker, on "Clay and the Clay Industry," The report is now in press and will be distributed at an early date by the Bureau of Mines, Toronto.

In Part I. of his report Mr. Baker gives, in 41 pages, an account of the character, origin and modes of occurrence of clay, written in such a way as to be understood, it is believed, by persons who have had little technical training. His age classification of clays will doubtless be found very useful by manufacturers as well as having an educational value from the side of culture. Every worker's interests will be widened and his mental attainments broadened by his understanding something of the origin and relationships of the materials with which he is dealing. There is nothing in Mr. Baker's report treating of the relationships of the various shales and clays—Erie, Red Top, Leda and Saugeen—with which every clay worker in the Province has something to do, that cannot be understood by almost any one who can read English. Manufacturing difficulties will thus be avoided and a scientific knowledge will be gained which cannot be estimated in mere dollars and cents.

The 15 pages of Part II. are devoted to the manufacture of clay products. In these pages the methods of manufacture are described and practical hints are given for overcoming difficulties which are met with almost daily in manufacturing

In Part III., pages 56-112, typical shale and clay working plants are described under the heading of counties, which follow one another in alphabetical order. This part of the report will be of local interest. The clay worker who desires to gain a knowledge of the modes of occurrence of his material, will have descriptions of similar occurrences in his own county with which to compare it.

Pages 112-120 deal briefly with various industries in which clay is used as part of the raw materials.

The 71 illustrations in the report have been carefully selected to represent typical occurrences of clay and shale, to throw light on the modes of occurrence of these materials and to represent various machines and plants used in the clay industry in the Province.

Mr. Baker's work in connection with the industry has not only been of value in the preparation of this report, but he has done work, which has been highly commended by clay workers in various parts of the Province, in giving practical advice in his visits to many plants.

Three or four years ago the clay workers, first of Ontario, and now of the whole Dominion, organized a society known as the Canadian Clay Products Manufacturers, which holds an annual meeting—the last three being at Waterloo, Hamilton and Toronto respectively—at which numerous papers are read and discussions are held on various topics connected with the industry. These meetings have proved very valuable and every clay worker of the Province should join the rapidly growing membership of the society.

The statistics of the clay industry show more clearly than can otherwise be done the relative importance of clay among mineral products. In this Province the manufactures from clay have till recently represented nearly 20 per cent. of the output of our total mineral industry. In the United States clay products form nearly 10 per cent. of the very large mineral output. Moreover, it should be remembered that a high percentage of the receipts from the clay industry are expended on labor and supplies. From this point of view no mineral industry can be claimed to benefit a community or a country more than that of clay.

BRITISH COLUMBIA IN 1906.

By Arthur Wheeler, Jr., Vancouver, B.C.

The year just past has been by far the best, from the standpoint both of tonnage and value, that British Columbia has had since her advent into the list of mineral producing countries of the world.

While the figures following are only approximate, full returns not being yet available, they have been compiled by Mr. Wm. Fleet Robertson, Provincial Mineralogist, and may be taken as rather under than over the mark.

Compared with the official figures for 1905, the estimate is:—

	1906.	1905.
Gold	$6,070,000	$5,902,402
Silver	2,200,000	1,971,818
Copper	8,690,000	5,876,222
Lead	2,690,000	2,399,022
Coal	4,590,000	4,152,936
Coke	1,050,000	1,358,925
Miscellaneous	1,100,000	800,000
Totals	$26,390,000	$22,461,325

Worked out these figures mean that copper has increased in value of production 49 per cent.; lead, 13 per cent.; silver, 11.6 per cent., and gold 3 per cent. Coal production has increased 10 per cent. and miscellaneous products 13½ per cent. Coke has fallen off slightly, owing to the seven weeks' strike in the Fernie coal mines during October and November last.

This strike not only lowered the possible production of coke, and coal, but seriously affected the copper, lead and silver production, as during the strike practically all the up-country smelters either closed entirely or seriously curtailed their output.

Consequently many of the mines ceased mining and undertook repair work, and, this reduced the possible output by perhaps $5,000,000.

As can be seen from the table above the total estimated value of British Columbia mineral output last year reached the enormous total of $26,390,000, which one, taking the population of the province as only 200,000, being less than the population of the city of Seattle, the fact of the richness of this province is made more apparent.

Figuring out the per capita production of mineral, mined in British Columbia in 1906, shows that nearly $132 was produced for every man, woman and child in the province.

Tonnage.

From statistics to hand, the ore tonnage for the past year is as follows:—

	Tons.
Coast (estimated)	90,000
Boundary	1,155,138
Rossland	281,711
Slocan-Kootenay	133,299
Total	1,660,148

ATLIN.

The gold output for this district for 1906 was approximately $500,000, with every prospect for a much increased production for the coming season, due to the fact that the advent of the Guggenheim Exploration Syndicate has led to much better processes for saving the gold and on a very much larger scale than heretofore.

Pine Creek.—Work on this creek has been confined almost entirely to two companies, the Pine Creek Power Company and the Atlin Consolidated Mining Company. Both of these companies have been very successful. The former operated two pits with three giants with 7-in. nozzles in each pit. From 20 to 25 men were employed in each pit and the plan of exploding 2,000 pounds of 75 per cent. powder in one blast was adhered to with the same gratifying results as in 1905.

The Atlin Consolidated Mining Company is operating above the Pine Creek Power Co. The company did not get properly started until August, when a 70-ton Bucyrus shovel was installed. After work started in earnest $1,000 was taken out every 24 hours.

On Boulder Creek, a tributary of Pine Creek, La Societe Miniere de la Colombie Britannique realized $40,000 for the season's work.

Spruce Creek.—It is this creek that the Guggenheims intend operating. They have secured practically everything excepting the property of the Spruce Creek Power Company. They will, in all probability secure enough stock in this company to gain control and will then, according to Mrs. Rosalind Watson Young, A.M., I.M.E., to whom I am indebted for the information concerning Atlin, which appears in the current number of the B. C. Mining Exchange, put in a bedrock flume and mine the gravel by steam shovel.

A company operating on Spruce Creek called the Northern Mines, Limited, has come to grief through having two managers. Another, the Columbia Hydraulic Company, has sold out because it installed a plant without having first prospected the ground, and still another, the British Columbia Dredging Company only operated for one month and, as returns were unsatisfactory, then ceased operations.

So far dredges have proved a total failure in Atlin and only steam shovels have paid the big operators.

McKee Creek.—Work is now confined to the McKee Amalgamated and the McKee Consolidated Companies, who have control of the creek. These two companies are under one management. H. Plumbe, who has been in charge for two years, in the absence of the Hamshaw Brothers, has secured for his company about $50,000 each year. In the coming season a steam shovel and tram system are to be introduced. McKee has been a dividend producer.

Speaking of this company, Mr. Fletcher T. Hamshaw, the manager, said recently: — "The steam shovel will be operated in conjunction with the hydraulics already in operation. I will hydraulic off the top material down to within 12 feet of bedrock, and pick up the gold-bearing gravel together with four feet of soft bed rock with the steam shovel.

"The plant will consist of a Bucyrus 110-ton steam shovel, one mile of railroad and switches, 30 six-cubic yard cars, two 20-ton electric locomotives and 1½ mile of flume. A permanent washing station will be built on the hogback near the canon, giving 160 feet of a dump, and the dump is at a point where the creek has a 12 per cent. grade. Ten cars will be dumped at one time, and all boulders will be hydrauliced on the grizzly under 150-foot head. There is a 120-foot dump for the grizzly. The system is gravity throughout. Owing to the heavy grade on this creek, the haul will be less than one-half mile on a down grade of one foot per 1,000 feet. The physical conditions are very favorable to economic working. A small sawmill will be taken in this winter on the ice, and the lumber sawed on the ground.

"The Guggenheims have made a success of their steam shovel on Tar Flats this summer, and I understand have bonded one-third of the district, so that I expect next year will see a great deal of development work, and the installation of new plants will greatly add to Atlin's output, and make it one of the heaviest gold-producing sections of the North."

WINDY ARM AND WHITE HORSE.

In both these districts extensive work has been going on all last season. A large number of properties are being opened up in and around Conrad City and Wynton, a town on the British Columbia side of the boundary line, built at the foot of Windy Arm.

Near Tutshi Lake some rich strikes have been made, copper, gold and silver values being very high in many of the ores found.

In all probability a smelter will be built at White Horse this summer.

The ores there are rich in copper, some shipments having realized 30 per cent. net at Tacoma, Wash., U.S.A., smelter. This long haul militates against the successful development of the camp and it is reported on excellent authority that Capt. John Irving of Victoria, B.C., the pioneer in copper mining, has succeeded in raising the necessary capital for the erection and working of a smelter in the White Horse district.

It is also reported that a large concentrating works will be erected at Conrad City to reduce the ores of the Windy Arm camp.

COAST DISTRICT.

The writer has just returned from an extended trip up the British Columbia coast and found throughout the entire coast line the signs of the most encouraging activity. The weather at present and for some time past has been too severe to permit of much work being done, but just as soon as the spring opens there will be one of the most startling mining booms that the coast has ever seen. During the trip I interviewed several miners returning from Portland Canal and the interior and all had the same story to tell of splendid mineral found and lots of it. Coast mining will be the subject of a future article and anticipating that I will briefly review the actual mining done on Portland Canal, Texada and Vancouver Islands.

Portland Canal. — The progress of this camp during the past season has justified all expectations. The many properties on which development work has been done has proved the fact that the ore bodies are of great extent and permanency.

Several new strikes were made, and of the many prospectors who visited the district, and prospected for the season, not one failed to locate property of value. Many of these also took up pre-emptions and purchased lots in the townsite, and erected houses on their holdings.

A considerable number of mining claims changed hands, and many more deals would have been made, but the prospectors for the most part refused to consider any proposition other than a part cash payment down, which in most cases led to the deal falling through. This policy is bad for the camp and and also for the prospector.

The delay in commencing the construction of the bridge across the Bear River, which is confidently expected will be built this fall, retarded progress greatly; the heavy snowfall of last winter caused an unprecedented high water in June and July, which rendered the cable by which the river is at present crossed unavailable for days at a time. In attempting to ford the swollen stream a party of prospectors were swept off their feet and only succeeded in reaching the shore by a miracle.

On Glacier Creek the greatest activity was manifested. McGrath and Griffin have exposed their lead on the Little Joe and Lucky Seven for the entire distance of the two claims, and have crosscut it in several places, exposing ore in every cut. They have also run 30 feet on the vein, and will continue work all winter. The Stewart Trading Company have an option on this property, which is one of the best located in the district, being only five miles from tide water and at an elevation of 2,000 feet. The average width of the vein is six feet, which is galena and iron pyrites with considerable lead carbonates, and the values run from $30 to $400 per ton in silver, lead and some gold. The vein lies in the contact between slate and porphyry, and the strike is N.W. and S.E., being the same as practically all the ledges in this district.

Adjoining McGrath and Griffin's property the Portland Development Company have a force of men at work sinking a shaft on their main lead, the ore of which is similar to other veins in the vicinity, the iron pyrites carrying gold to the amount of $60 per ton.

On the Olga, purchased a year ago, for a few hundred dollars, D'Arcy McDonald has a good showing, an average assay of the dump giving $51 in silver and lead.

A half interest in the Jumbo group was sold to S. Silverman, of Seattle. S. Gourley, who still retains the other half, has refused many offers for his interest. No work was done on this property other than the usual assessment work, which was also the case on the adjoining claims, the Halla and June. An offer to bond these claims for $30,000 was refused a year ago, but a deal is now pending at an increased figure.

Some new locations were made adjoining these claims by J. Welch, P. Boyle, Hucker and Strickland, of Ketchikan. This ore is arsenical iron pyrites, and carries values gold, $37; silver, 6 oz.; copper, 2 per cent. A group of claims was also located by J. Perault, for Ketchikan people on similar ore, three miles further south, the average from which was $10 in gold.

Rush and Bagg have been working on their lead all summer, and have proved the property to their satisfaction. Some of the ore from this claim runs 2,000 ozs. in silver.

On claims owned by M. K. Rogers the usual assessment work was done. The Copper King was

bonded by G. M. Brown, of Seattle, the first payment has been made, and Mr. Brown, who is now in Seattle, is expected back shortly, with material to work the property all winter. This ledge is 39 feet in width, and carries values from 8 to 12 pert cent. copper with a little gold.

McKay and Bibeau will ship some ore this fall from their claim, which is proving, on development, to be one of the best in the district.

Bert Ranche will make a ten-ton trial shipment from his claim, the Main Reef, as soon as the Stewart Land Company have finished their floating wharf. The ore averages $90 in silver and lead, and the property is favorably situated, being only six miles from tide water.

On the Sunbeam the ledge has been traced throughout the entire claim, and open cuts run, showing up a large body of ore, with a well defined pay streak.

Several new locations were made on Bitter Creek, of which the Copper Canyon group seems the most promising. The main ledge on this property is three feet in width, lying in slate and porphyry, and contains values of $41 in copper and gold.

On the Roosevelt, a copper-gold property on which development work has been carried on for some years, a four-foot vein of galena was located, which promises to rival the original location both in extent and value.

While doing assessment work on the Rainier, Fred Rainey discovered a three-foot vein of galena and quartz with about eight inches of lead carbonates, an assay from which gave $174 in silver and 60 per cent. lead.

Among new locations made was the Greenhorn group, a three-foot ledge of quartz carrying copper 12 to 20 per cent., silver 6 oz. Also a group of claims 22 miles from Stewart on an iron cropping carrying values in gold and copper.

On American Creek, the American Girl group maintains its pre-eminence. Only assessment work was done on the claims this season by the owners, who, owing to the San Francisco disaster, were involved in a delay in regard to the taking over of the property. A new lead was discovered on the ground carrying high values in silver.

On the May Bee and Louise a tunnel was run on the ledge which is 17 feet in width; the pay streak is 2½ feet, and averages $35 in silver. This ledge is crosscut by a canyon, and a vertical depth of over 100 feet of the vein is exposed.

Assessment work was also done on the Rangoon and Bandolier, and some good ore discovered, assays giving silver, $341; copper, 27½ per cent.

Work was carried on all winter on the Kansas group, and 70 feet of tunnel run. Some new locations have also been made on this creek which promise well. The season is now practically over, and many of the prospectors are leaving. Many have gone to Maple Bay Mines, where 150 men are now at work. It is expected that about 50 men will winter here, and should the erection of the bridge be commenced immediately probably many more will remain.

Texada Island.—On Texada the Marble Bay Mine has been steadily shipping high grade bornite ore all the year at the rate of 1,000 tons per month, netting the operating company about $25,000. This mine is perhaps the most profitable in British Columbia and has the best showing of copper ore in the province. The ore at present being mined is obtained at the 800-feet level which is 950 feet below sea level. The writer visited the mine last April and thanks to the courtesy of the manager, Mr. Alexander Grant, had the privilege of examining the mine in company with Mr. Charles Sangster, the coast representative of the Rand Drill Company, and several well-known mining men from Vancouver, including Mr. W. Thos. Newman, M.C., M.I., and the foregoing facts were ascertained then and have since been corroborated by many.

Further north, on Texada Island, the Loyal group owned and operated by Mr. Jacobs, of Seattle, is showing up well as are also the Copper Queen and the Cornell adjoining the Marble Bay. The two are operated by Seattle capital and are both paying good dividends.

Half way across the Island and five miles from the Marble Bay, W. Thos. Newman is opening up the Commodore Mine with considerable success. The showings on this property are remarkable and the geological conditions offered a field for the most thoughtful consideration and were most carefully investigated before any work was undertaken.

The work on the Commodore is now in an advanced stage and Mr Newman reports that next summer will see the Commodore a big producer.

Vancouver Island.—The Tye Mine, on Mount Sicke, has continued to ship ore all year and, in addition, has been steadily sinking, prospecting for the ore body at depth. In this mine the main ore body extends through Mount Sicke in the form of a huge shoot at about the 300-feet level. This shoot is about exhausted but the management has succeeded in locating similar ore but of much lower grade at the 1,000-feet level, and is now cross-cutting this body at the 1,250-feet level. Whether this cross-cut has cut pay ore or not is not yet known. The Tyee Company, however, is in splendid shape, and after paying dividends for years, building a smelter and operating the mine, has the original capital intact in the books in London, Eng., and can by securing new ground still continue business. Mr. Clermont Livingstone, the resident managing director, reports that work on an adjoining property, the X. L., is showing up some good ground.

Adjoining the Tyee is the Richard III, in which, recently, an important strike of high-grade copper ore was made. This property will be one of the



Canadian Government Mineral Exhibit, Christchurch, New Zealand.

most important shippers in Vancouver Island this coming year.

On the west coast of Vancouver Island, there is every prospect of renewed life in a mining sense this year. Very little work of any description was done last year.

THE INTERIOR.

While on the coast there has been, and is, a very healthy movement in mining, the interior mines have been the mainstay of the industry during the past year. The great bulk of the tonnage has, as can be seen from the table of shipments given at the beginning of this article, come from the Boundary country, assisted materially by Rossland and Slocan-Kootenay.

The greatest producer has been, and is, the Granby Company, operating at Phoenix. Out of a total ore tonnage from the Boundary country of 1,155,138 tons, this company shipped to their smelter at Grand Forks, 804,598 tons or 69 per cent. The Dominion Copper Company ranks next with 216,788 tons and the British Columbia Copper Company third, with 121,241 tons.

The output of the latter company was curtailed very considerably owing to the fact that the plant at Greenwood was closed down for several months while the smelter capacity was being doubled. The smelting capacity of this plant is now 1,500 tons per day and a very large increase may be looked for from the British Columbia Copper Company's mines this year.

According to Mr. W. B. Wilcox, the editor of the Phoenix Pioneer, to whose excellent special number, just published, I am indebted for the information on the Boundary, in six years and a half the mines of the Boundary have sent out to the district smelters approximately 4,644,000 tons of ore. This is from 1900, in the midle of which year ore shipments were commenced, to the end of 1906. It will thus be noted that the progress has been little short of marvellous. In 1900 but 97,000 tons were shipped, while in 1906 a total of about 1,191,000 tons of Boundary ore were dug out of our mines and sent down the hills in different directions to the three district reduction works—eleven times as much in 1906 as in the year 1900. To show the yearly progress and increase of output the following table is given:—

1900	97,000	tons.
1901	390,000	"
1902	509,000	"
1903	690,000	"
1904	830,000	"
1905	953,000	"
1906 (Dec. estimated)	1,191,000	"
Grand total	4,660,000	"

Not only has the British Columbia Copper Company increased the capacity of their smelting plant but the Granby Company has also considerably enlarged some of their furnaces, and at present the Dominion Company are spreading out and are at least doubtling their smelter capacity at Boundary Falls.

The recovery of copper per ton from the ore of the mines of the Boundary is known to be low, comparatively speaking, and an average rate of 25 to 30 pounds per ton is considered conservative. On this basis, the copper fine production of the Boundary mines for the first year of ore shipping, 1900, was but 3,000,000 pounds. On the same basis, the recovery for 1906 will amount to about 35,000,000 lbs.—an amount sufficient to make it worth while in the world's grand total. Altogether the mines of the Boundary in these seven short years, have contributed approximately 140,000,000 pounds of copper. In addition to this there are the gold and silver values to be considered. The values of the ores thus treated would amount to more than $25,000,000, not taking into consideration the high prices prevailing for the brown metal for the last year or more.

The Granby Company is spending about $100,000 at present on the Victoria property shaft and headworks. This shaft, when completed, will be the permanent working outlet for the whole of the company's mines in Phoenix. They are now down 400 feet, the shaft has been timbered and will be ready for use in the early spring. The hoisting engine will be driven by electricity and is 250 h.p. There are at present two crushers of 150 tons per hour, minimum, capacity and another is being installed at the headworks of a like size, giving the company the necessary machinery to crush 450 tons per hour, minimum.

Ore bins are being erected at the shaft and both the Canadian Pacific and the Great Northern Railway companies are making arangements for connections.

Development work has been steadily pushed and is now years ahead of needs. More properties have been secured. The Gold Drop group has been extensively exploited and has proved the property has immense tonnage. On the Curlew a large tonnage has also been opened up. This claim being below the Gold Drop may eventually be used to tap the ore reserves of the latter by means of tunnelling.

On the Dominion Copper Company's property new machinery is being installed with a view to increasing the shipments to meet the requirements of the new enlarged smelter.

The B.C. Copper Company has been working towards a much larger output from their Mother Lode mine. The output from this mine will be trebled and will, it is confidently expected, ship 1,500 tons per day this year. The Emma, in Summit Camp, on the C. P. R. branch, from Eholt to Phoenix, has also been extensively developed. The company, last year, purchased outright the Oro Denoro, adjoining the Emma of the B.C. mine in the same camp. The B.C. mine, in the past, has shipped 100,000 tons of ore while the Oro Denoro is known to have large reserves of ore which can be cheaply mined, and being situated right on the railway very cheaply shipped.

A most important feature in connection with the huge operations in the Boundary country, is the fact that the Granby Company has paid dividends during the past year at the rate of 12 per cent. on a capitalization of $15,000,000 on 1.1 per cent. copper ore. Considering that the original price of the stock was 25 cents on the dollar this means that original holders received, last year, about half their original investment back in the shape of dividends and hold their stock now at 33 per cent. above par.

One important feature of the year's development in the mines of the Boundary was the advent of the Consolidated Mining & Smelting Company of Cananda to Phoenix, when that company took a lease on the well known Snowshoe mine here. That this company, which is operating so successfully at Rossland, should reach out into the Boundary and take up one of the large properties, is another evidence that the Boundary is attracting the attention of more and more mining men of note. The Snowshoe is now shipping ore daily.

While Boundary's copper mines have been shattering all previous records for output, etc., the high grade silver and gold mines of this section have not been forgotten. Chief among these is the Providence, near Greenwood, which is to-day a better mine than ever before. A dividend of some $16,000 was paid in September, and development with some 35 men has been steady all this year. The company will doubtless make an even better record during the year to come.

The Skylark is another silver mine that has done well, having paid for development and the bond also from the proceeds of the ore shipments in the last two years. Its Phoenix owners should begin to receive some profits this coming year.

Among the large number of mines in the high-grade belt that are looking well and doing satisfactorily may be mentioned the Elkhorn, Prince Henry, Strathmore, Bay, Mavis, Crescent, Don Pedro, E. P. U., Helen, Tip Top, Greyhound, Moreen and a dozen others.

(To be continued.)

THE CANADIAN ROCKIES.*

By Reginald A. Daly.

(Continued.)

It is well known that one of the first designations of the entire mountain group lying between the Pacific and the Great Plains was due to Humboldt. His "Cordilleras of the Andes" extended from Cape Horn to the mouth of the Mackenzie river. Humboldt occasionally used the singular form "Cordillera of the Andes" for the same concept. In view of the general restriction of the term "Andes" to the mountains of South America, Whitney, in 1868, proposed that the name "Cordilleras," with variants, "Cordilleran System" and "Cordilleran Region," be retained to designate the North American equivalent of the Andes. This name was adopted in the United States census reports for 1870 and 1880, and by a great number of expert geologists and geographers since 1868. In process of time, however, the singular form, "Cordillera" and variants, became used in the same sense. In one of these forms the Humboldt root word with Whitney's definition has entered many atlases. It appears on numberless pages of high-class Government reports, geographical, geological, and natural history memoirs, and of such works as Baedeker's "Guide-book to the United States," Stanford's "Compendium of Geography," etc.

The time-honored, erroneous, similarly inclusive name "Rocky Mountains," with variants, "Rocky Mountain System," "Rocky Mountain Belt," etc., has, however, held the dominant place in the popular usage. Its inappropriateness for the heavily wooded Canadian mountains is abundantly evident. For the United States, Clarence King wrote a generation ago—

"The greatest looseness prevails in regard to the nomenclature of all the general divisions of the western mountains. For the very system itself there is as yet only a partial acceptance of that general name Cordilleras, which Humboldt applied to the whole series of chains that border the Pacific front of the two Americas. In current literature, geology being no exception, there is an unfortunate tendency to apply the name Rocky mountains to the system at large. So loose and meaningless a name is bad enough when restricted to its legitimate region, the eastern bordering chain of the system, but when spread westward over the Great Basin and the Sierra Nevada, it is simply abominable."†

The following table summarizes the above-mentioned variants along with others more recently introduced, and still other general names now only of historical interest. The names of prominent authorities and the leading dates when they have published the respective titles are also entered in the table. The authority for some of the older names is Whitney's work on the United States, published in Boston, 1889.

Mountains of the Bright Stones—
General use, end of eighteenth century.

Shining Mountains—
Morse, "Universal Geography," 1802.

Stoney or Stony Mountains—
Arrowsmith, 1795; President Jefferson.

Columbians (*sic*) Mountains—
Tardieu, 1820.

Chippewayan Mountains—
Hinton, 1834.

The Cordilleras of the Andes (in part)—
Humboldt, 1808, etc.

The Cordillera of the Andes (in part)—
Humboldt, 1808, etc.

The Cordilleras—
Whitney, 1868; many authors since.

The Cordillera—
G. M. Dawson, 1884, etc.; Gannett, 1898; Rand-McNally, 1905.

The Western Cordillera of North America—
J. D. Dana, 1874, 1880.

The Cordilleras of North America—
Hayden, 1883; Leconte, 1892, etc.

The Cordilleran Region—
Whitney, 1868, etc.; Hayden, 1883; Shaler, 1891.

The Cordilleran System—
Whitney, 1868, etc.; King, 1878; Baedeker, 1893.

The Cordilleran System—
Hayden, 1883.

The Cordillera Belt—
G. M. Dawson, 1879; etc.; Rand-McNally, 1902.

The Pacific Cordillera—
Russell, 1899, 1904.

The Cordilleran Plateau—
Hayden, 1883.

The Cordillera of the Rocky Mountains—
J. D. Dana, 1895.

The Rocky Mountain System—
Leconte, 1892, etc.; Heilprin, 1899; many others.

The Rocky Mountain Region—
Powell, 1875, etc.; G. M. Dawson, 1890; Gannett, 1899.

The Rocky Mountain Belt—
Rand-McNally, 1902.

The Rocky Mountains—
Lewis and Clarke; popular.

The Pacific Mountains—
Russell, 1899, 1904; Powell, 1899.

The Western Highland.
Baedeker, 1893; Keith Johnston Atlas, 1896; Davis, 1899.

The Rocky Mountain Highland—
Frye, 1895, 1904.

The Western Plateau—
English Imperial Atlas, 1892.

(To be continued.)

* Published by permission of the Canadian Commissioner, International Boundary Surveys.

† "U. S. Geological Exploration, 40th Parallel, Systematic Geology, 1878," p. 5.

THE TREATMENT OF ARSENICAL ORES.

By Chester F. Lee, Mining Engineer.

The Cascade range is noted for the arsenical character of many of its ores. At Monte Cristo, Goat Lake, Silverton, Silver Creek, Elba and many other places a considerable arsenic content is a characteristic. Not all the ores of this range are arsenical by any means, but those in which this constituent is prominent are so widely spread and so considerable in amount that the handling of them and the getting of some return for the arsenic contained is a vital matter. The only plant in the state that can make marketable arsenic (the white arsenic of commerce, As 2 O3) is at Everett, and indeed, until 1904, when the Anaconda works in Montana were supplied with a plant for extracting arsenic from flue dust, this was the only place in the United States where it was made.

At the present time, what ores of this class are treated at all are shipped to smelters and treated as gold or silver ores pure and simple, and a penalty of about 50c is exacted for each per cent. of arsenic over a certain amount and the smelters refuse to take on any terms ores high in this metal; as they claim that the volitilization of arsenic in the roasting furnaces and the smelter stacks causes undue losses of the precious metal. Producers of ore have long contended that not only should they not be penalized for their arsenic, but they should be paid for it. They point out that the Anaconda works has produced, in the three years ending July 1st, 1906, 1,107,176 pounds of white arsenic, all of which was sold at a good price and all of which came from a by-product, flue dust.

If this is the case, how much more ought their ores, rich in arsenic and of fair gold and silver values, to have the treatment suited to them the pecuniary benefit of which would be felt in every mining district of the state.

The quantity of these ores and the development work done on the properties that can produce them is sufficient to warrant a constant and increasing supply; why, then, cannot this metal receive the same sort of attention accorded to copper, lead, zinc, etc.? The reason probably is that the metallurgy of arsenic has had no attention in this country, as heretofore there has been no visible supply of the raw material. The beginning of better things seems to be now at hand, and the American Smelting & Refining Co., to whose tender merices we seem to be irrevocably committed as far as reduction works are concerned, are said to have promised some return for arsenic in a certain district, provided a sufficient tonnage to be regularly shipped was guaranteed them.

White arsenic is worth on the average from 3 to 3½ cents per pound. This is the grade known as "commercial."

You will see quoted in the lists of chemicals "refined" and "C.P." (chemically pure) at rates several times this and at the present time, in sympathy with other metals, the price is considerably above this, but an average of 3½ is all that it is safe to count on year in and year out, for the unrefined product.

The general run of the Cascade ores of this class contain from 3 to 10 per cent. of metallic arsenic (As.). About 6 per cent. may be taken as a fair average, as that is what a careful sampling of two of the best known mines gives. Six per cent. metallic arsenic will produce 160 pounds of commercial white arsenic theoretically (6 per cent. is 120 pounds per ton; allow one-third more for the oxygen absorbed from the air, as the atomic weight of As2 is 150, and of O3 is 48.), and we have 160 pounds white arsenic, allow 5 per cent. loss on this in the process of obtaining it, and we have 150 pounds net; now deduct for the cost of reduction, packing in barrels, freight, etc., 1½c per lb., and we have 150 pounds at 2c., or $3.04 as a fair return on a 6 per cent. ore. Many of our Cascade ores carry from $6 to $10 in gold and silver, and this extra $3 would make all the difference with them between success and failure, between profit and loss in the mining operations. It costs not a cent more to get this ore out than formerly, and if $3.00 even can be added to the returns, it is an addition to the net.

Aside from the possibilities of shipping and smelting the ore raw there are at least three other courses open: 1. Water concentration with subsequent smelting of concentrates. 2. Cyanidation of the raw ore for gold and silver, and subsequent roasting for arsenic. 3. Roasting for arsenic with subsequent smelting of the roasted residue.

To take them up in order: Water concentration has been tried at Monte Cristo with only partial success. The sulphides and arsenides which carry the values are softer and more brittle than the quartz in which they occur and excessive fines and slimes result from grinding, the losses in this particular case are said to have run from 30 to 40 per cent. This mill has been lately repaired and will begin a new campaign in the spring under new management and the results will be looked for with interest. There are arsenical ores in other places in the Cascades better adapted to concentration than those of Monte Cristo, ores that are less massive and more granular as to the sulphides and in which the quartz and other gangue matter is not so tough and hard.

Raw cyaniding of sulphide ores has made a good deal of progress in the last few years and has been very successful in a number of cases. Cascade arsenical ores have been the subject of experiment here in Seattle in the laboratory and on a small practical scale and enough has been done to show that the thing is feasible in this case. An extraction of gold of 80 to 90 per cent. has been obtained and the estimated cost in a 100-ton plant is $1.50 a ton for operation. After cyaniding and washing

the ores can be roasted for arsenic. This roasting should not cost more than 50 cents per ton.

The third possibility is to roast the ore first for arsenic in a comparatively inexpensive plant at the mine and ship the roasted ores to the smelters for the extraction of the precious metals. This would obviate many difficulties at present encountered. The ore would be freed from nearly all the sulphur as well as their arsenic, which would result in a slight enrichment of the product, the arsenic could be marketed by the producer and the smelters would be eager to get the desulphurized and dearsenuretted product and would be willing to pay good rates for it.

Good returns await the company that has ore reserves large enough and the courage great enough to be the pioneer along these lines. Either of the two latter methods should be the subject of careful experiment on a small working scale before works of any size are built. Under competent direction tests can be made at a reasonable cost with results that will be reliable and of great benefit to the mine owner and the mining industry of this section.

CORRESPONDENCE.

FROM THE ANTIPODES.

Dear Sir,—

I have sent you, under separate cover, photos of the mineral section of the Canadian Exhibit. It is by far the largest and most complete collection of economic minerals here, and our installation is quite different from any of the other exhibits.

The exhibition was opened on the 1st of November by the Premier, Sir Joseph Ward, and his first official visit was to the Canadian Court. He was very much impressed with the extent of our mineral resources.

The general public are more interested in our exhibit of asbestos, mica, nickel and cobalt, these minerals being new to New Zealand.

I have not had time to visit the mining districts, but will do so later on, the Minister of Railways having given me every facility for doing so.

The attendance, so far, has been very good and there is every prospect of the exhibition being a great success. Up to date the number of admissions is over 517,000.

New Zealand is a delightful country and the people the most hospitable I have ever met. There is no doubt whatever but that the trade relations between Canada and New Zealand will be materially increased as a result of the exhibition.

I shall be pleased to send you my impressions of the different mineral exhibits here, also anything I may come across during my trip through the colony.

With best wishes for the New Year.

Yours very sincerely,

R. L. BROADBENT,

The Editor, Canadian Mining Review,
Montreal.

[We reproduce in this issue two interesting photographs that accompanied Mr. Broadbent's letter.—Editor.]

We are requested to state that all communications, mail and express matter to the American Institute of Mining Engineers, or the United Engineering Society Building, should be addressed to 29, West 39th Street, New York City.

EXPERIMENTS WITH COBALT ORES.*

By Henry M. Howe, LL.D., William Campbell, Ph.D., and Cyril W. Knight, B.Sc.†

(New York Meeting, April, 1907.)

This paper gives the results of an investigation of the behavior of the argentiferous cobalt-nickel arsenides of Temiskaming, Ontario, in roasting, made in the metallurgical laboratories of the School of Mines of Columbia University in the City of New York. The ore was kindly given by the owners of the La Rose and Trethewey properties at Cobalt, Ontario, and Mr. E. J. Hall, Tutor in Assaying in Columbia University, has helped us much.

I. Object of the Investigation.

The object of the investigation was to learn:—

1. The temperature at which the arsenic is most rapidly expelled;
2. The thoroughness with which it is expelled by prolonged roasting at this temperature;
3. The effect of adding charcoal (a) near the end of the roast and (b) at the beginning of the roast.

II. Nature of the Ore.

The important ores mined in the Temiskaming deposits are: native silver—with small amounts of dyscrasite (Ag_6Sb), argentite (Ag_2S), pyrargyrite (Ag_3SbS_3)—smaltite ($CoAs_2$), chloanthite ($NiAs_2$) and niccolite (NiAs). Mispickel (FeAsS) and cobaltite (CoAsS) also occur in smaller quantities. The average composition of the ore shipped from this district for the first six months of 1905 was: silver, from 4.1 to 4.8 per cent.; cobalt, from 6.9 to 8.2 per cent.; nickel, from 3 to 4.7 per cent.; and arsenic, from 30.9 to 34.6 per cent. The ore which we treated consists chiefly of smaltite. In our laboratory-work the temperature was kept below the melting-point of silver (960° C.) in order to prevent loss of that metal, though our preliminary experiments showed that these ores do not frit or clog at this or even at a somewhat higher temperature.

The Temiskaming ores contain little gold, only $0.40 per ton in case of the ores which we treated.

III. Sampling and Assaying.

About 43 lb. of the ore, in lumps about 3-in. cubes, were crushed so as to pass through a sieve of 20 meshes to the linear inch. In this crushing we caught and separated particles of metallic silver which represented about 75 oz. of silver to the ton of ore, or about 11 per cent. of its total value. Some of these particles were about 0.25 in. in diameter.

For assaying, a lot of 37 assay-tons was next separated from this crushed product by means of a "split" sampler, and then ground so as to pass a sieve of 100 meshes to the linear inch. In doing this a second lot of metallic silver particles, representing 117 oz. per ton of ore, was separated.

The results of 12 crucible-assays and 9 scorification assays were:—

	oz. per ton of ore
Metallic silver by the crucible process.....	477
Metallic silver by the scorification process. ..	497
Add metallic silver separated in crushing.. ..	75
Add metallic silver separated in grinding. ...	117
Total silver-content	689

The ore contains 56 per cent. of arsenic.

For the silver-assay the following quantities were used: For scorification, 0.2 A.T. of ore was roughly divided into halves, each of which was scorified with 60 g. of lead and 1 g. of borax-glass. The resulting two beads were weighed together. For the crucible process, 0.5 A.T. of ore, 2.5

* A paper to be read before the American Institute of Mining Engineers, April meeting.

† Respectively Professor, Instructor and Student of Metallurgy in the School of Mines of Columbia University in the City of New York.

A.T. of lead oxide, 2-3 A.T. of soda, 1-3 A.T. of borax-glass, and 4.5 g. of argol were used.

IV. The Roasting.

The roasting was done in an American Gas Furnace Company's oven, 27 in. long and 20 in. wide inside.

The ore was held in shallow iron pans resting on the hearth of this furnace, and lined with 0.5 in. of fire-brick.

The temperature was measured by means of a Le Chatelier pyrometer. The thermo-couple was protected from arsenic and other fumes by a porcelain tube, and was placed immediately above the ore. It entered through a circular hole in the back of the furnace and was connected with a Keiser and Schmidt galvanometer, standardized by means of the melting-points of zinc, aluminum and copper. The temperature was recorded and the ore rabbled every 10 min. In none of the roasts was any fritting or clogging of the ore noticed.

V. At What Temperature is the Arsenic Expelled Most Rapidly?

Roast No. 1.—In this test, 3.5 lb. of the ore, crushed to pass a 20-mesh sieve, were placed in the furnace, the temperature of which had previously been raised to 490° C. The temperature was then gradually raised at the rate of about 120° C. per hour, until it finally reached its highest point, 870°C. Samples were taken with the usual precautions, and their arsenic was determined by fusion with sodium peroxide, neutralizing with acetic and sodium hydroxide (using phenolphthalin as an indicator), precipitation as silver arsenate with silver nitrate, and titrating with ammonium thiocyanate.*

The results of the roast are given in Table I.

Though the arsenic escaped pretty rapidly at first, yet towards the end of the second hour its escape was almost completely arrested, in spite of the continued regular rise in temperature. But when the temperature reached 840°, the expulsion of arsenic again became rapid. These results tend to prove that the behavior of smaltite resembles that of pyrite, of which the first atom of sulphur is removed at a much lower temperature than the second.

Table I.—Record of Roast No. 1. Gradually Rising Temperature.

Temperature of Roast. Deg. Centigrade.	Time from the Beginning. Hr. Min.	Quantity of Arsenic in Ore at Different Stages of the Roast Per Cent.
490	0 : 00	55.9
559	0 : 25	
547	0 : 35	
577	0 : 45	
591	0 : 55	
596	1 : 00	46.6
601	1 : 05	
611	1 : 15	
624	1 : 25	
641	1 : 35	
666	1 : 45	
691	1 : 55	
706	2 : 00	40.7
721	2 : 05	
735	2 : 15	
763	2 : 25	
788	2 : 35	
814	2 : 45	
828	2 : 55	
838	3 : 00	40.3
848	3 : 05	
844	3 : 15	
864	3 : 25	
858	3 : 30	35.4
872	3 : 35	
863	3 : 45	31.0

*Miller's Quantitative Analysis for Mining Engineers, p. 114.

Conclusions.—1. That 15 per cent. of arsenic (per 100 of ore), i.e. 27 per cent. of the total arsenic, is expelled below 700° C.

2. That the rest of the arsenic is not expelled until the temperature reaches about 840°, when rapid expulsion again sets in.

VI. How Thoroughly Can Arsenic be Expelled at 890° C?

Roast No. 2.—In this roast about 3 lb. of ore, ground to pass a sieve of 20 meshes to the linear inch, were raised quickly to about 890° C. (a temperature a little above that which Roast No. 1 had shown that arsenic is rapidly expelled), and held near that temperature for about four hours, with frequent rabbling.

As shown in Table II, the arsenic was expelled fairly rapidly until it had fallen to about 20 per cent., but thereafter very slowly.

Table II.—Record of Roast No. 2. Temperature Held Near 890° C.

Temperature of Roast. Room Temperature. Deg. Centigrade.	Time. Hr. Min.	Quantity of Arsenic in Ore at Different Stages of the Roast. Per Cent.
463	0 : 35	55.9
533	0 : 45	
622	0 : 55	
693	1 : 05	
738	1 : 15	
795	1 : 25	
846	1 : 35	44.6
895	1 : 45	
895	1 : 55	38.0
909	2 : 05	
897	2 : 15	26.3
901	2 : 25	
886	2 : 35	21.7
883	2 : 45	
883	2 : 55	19.3
883	3 : 05	
885	3 : 15	
889	3 : 25	
883	3 : 35	18.3
891	3 : 45	
894	3 : 55	
899	4 : 05	
897	4 : 15	
902	4 : 25	
900	4 : 35	17.5
900	4 : 45	
898	4 : 55	
887	5 : 05	
883	5 : 15	
878	5 : 35	17.3

VII.—Does Charcoal Added after Roasting at 890° Cause Further Expulsion of Arsenic?

Table III.—Record of Roast No. 3. Charcoal Added After Roasting Near 890° C.

Temp. of Roast. Room Temp'ture. Degrees Centigrade.	Time from the Beginning. Hr. Min.	Quantity of Arsenic in Ore at Different Stages of the Roast Per Cent.
470	0 : 35	55.9
606	0 : 45	
660	0 : 55	
723	1 : 05	
815	1 : 15	
856	1 : 25	
873	1 : 35	
886	1 : 45	
872	1 : 55	
864	2 : 05	
870	2 : 15	
874	2 : 25	
888	2 : 35	
875	2 : 45	
897	2 : 55	
890	3 : 05	15.8



Canadian Government Mineral Exhibit, Christchurch, New Zealand.

	Charcoal added here.	
882	3 : 20	
882	3 : 35	
894	3 : 50	
884	4 : 05	15.0

Roast No. 3.—In order to learn whether an addition of charcoal after long roasting between 840° and 890° C. (temperatures between which we had found that arsenic is expelled rapidly) causes further expulsion of arsenic by reducing the fixed arsenates to the volatile forms of arsenious acid and metallic arsenic, one of us roasted a third lot of ore at temperatures between 870° and 890° for 1.5 hr., and, without removing it from the furnace, he then stirred in 10 per cent. by weight of charcoal, ground so as to pass a sieve of 10 meshes to the linear inch, but not one of 20 meshes. The results are shown in Table III. If too coarse, charcoal disintegrates and scatters the ore, and if too fine it burns away too fast.

At the time of adding the charcoal, fumes of arsenic had ceased to be visible, but this addition caused a sudden evolution of dense fumes, which lasted for only a few minutes.

The charcoal had little effect on the arsenic. Before its addition the ore contained 15.8 per cent. of arsenic, and 1 hr. later this had fallen only to 15 per cent.

In this roast, after the ore had been exposed to a temperature above 856° for 1 hr. 40 min., its arsenic-content had fallen to 15.8 per cent., whereas in Roast No. 2, after it had been exposed 2 hr. to temperatures above 846°, it still contained 18.3 per cent. of arsenic. This difference tends to show that unnoticed variations in conditions may materially influence the rate of expulsion, as is the case in many roasting-operations.

The fact that the arsenic was expelled in this roast, before the addition of the charcoal, more thoroughly than in any of the others, in spite of the very rapid raising of the temperature at the beginning, goes to show that the behavior of smaltite differs in an important way from that of pyrite, the temperature of which must be raised very carefully and slowly, lest the fritting or enamelling of the outer surface of the individual particles prevent the free access of the air to their interior, and thus arrest the roast.

VIII.—Does Charcoal Added at the Beginning of the Roast Increase the Expulsion of Arsenic?

Roast No. 4.—About 2 lb. of ore were mixed with 10 per cent. by weight of charcoal, raised to 880° in 2 hr., and held near that temperature for 1.75 hr. more, or a total of 3 hr. 45 min. The charcoal seems to have had little effect, because at the end of this time the ore still contained 17.5 per cent. of arsenic, or more than in Roast No. 3 after it had been above 856° for 1 hr. 40 min., and but little less than in Roast No. 2 after it had been above 795° for 2 hr. 10 min.; and in each of these latter cases the expulsion of arsenic was brought about without the use of charcoal.

These cases are here recapitulated:—

Roast.	After Remaining Above	For	The Ore Still Contained
No 2	846° without charcoal.	2 hr.	18 3 per cent. of arsenic
No. 3	856° without charcoal.	1 hr. 40 min.	15.8 per cent. of arsenic
No. 4	880° with charcoal.	1 hr. 45 min.	17.5 per cent of arsenic

IX.—Does Finer Grinding Increase the Expulsion of Arsenic?

Roast No. 5.—In order to learn whether finer grinding would lead to further expulsion of arsenic by exposing the ore more fully to the air, the ore which had already undergone Roast No. 3 was re-ground so as to pass a sieve of 100 meshes to the linear inch, and re-roasted for 2 hr. 30 min. at about 880° C.; but this re-roasting caused no farther expulsion of arsenic.

X.—Summary of Results.

The following conclusions apply only to the particular ore here treated:—

1. The percentage of silver as determined by the scorification-method is about 4 per cent. higher than as determined by the crucible-method.

2. The ore neither clogs nor frits at or even somewhat above 960°, the melting-point of silver.

3. The arsenic can be reduced from about 56 to 41 per cent., or by 15 per cent., by roasting below 700° C. (Roast No. 1, Table I.).

4. It can be further reduced by about 24 per cent., viz.: —to 17 per cent., by roasting at temperatures above 840°, and in this higher range the arsenic is removed much faster than at lower temperatures. (Roast No. 2, Table II.).

5. Hence our inference that the behavior of smaltite in roasting is probably analogous to that of pyrite, which loses its first atom of sulphur much more readily than its second; yet, unlike pyrite, this ore may be raised suddenly to 800° without harm, because, unlike pyrite, it does not frit or enamel when thus suddenly heated, but remains open and porous, so that the air may penetrate it. (Roast No. 3.)

6. Charcoal, whether added at the beginning or towards the end of the roast, fails to increase the expulsion of arsenic. (Roasts 3 and 4.)

7. We doubt whether it will pay to reduce the arsenic-content below 20 per cent.; even by roasting at temperatures above 890° C., because its further reduction is very slow.

A NEW MINING ASSOCIATION.

The Hastings (Ont.) Mining Association has been incorporated with the following members:

Mr. W. A. Hungerford, Vice-President of the Atlas Arsenic Co., was unanimously elected President.

Mr. Arthur Coe—1st Vice-President.

Mr. E. B. Davies—2nd Vice-President.

Mr. S. Wellington—3rd Vice-President.

Mr. D. Gillen—Secretary.

Mr. R. T. Gray—Treasurer.

The Vice-President, in his address at the organization meeting held in Madoc, spoke as follows:

I can assure you I consider it a very great privilege to have this opportunity to speak to you this evening on a question that is of the deepest importance to this section of Ontario and this county in particular. We have met here to-night for the purpose of organizing two associations, both with the same object in view, the welfare of the community. And I do not think there is a gentleman here to-night, but is heartily in accord with the object of this meeting. I am not intending to speak altogether in the interest of the Board of Trade, only that I sincerely hope you will be successful in forming such an organization as at this time, more than at any other time in the history of Madoc, such an organization should be formed. But I would like to say a few words in behalf of the mining interest of Eastern Ontario. As we, the miners of this section, feel that the present mining laws and regulations are not adapted for this section, and that the legislation that has taken place is all based in the interest of the Cobalt section, and not for the older portion of the province. And we feel separate legislation should be made, so as to meet the wants of the eastern district. The conditions existing in this section, and the Cobalt section, are so far apart that the same laws and regulations cannot govern both districts satisfactorily. We also feel that nothing has yet been done by the present Government that has benefited in any way this portion of Ontario, not that they wish to discriminate against this section, but from their want of reliable information regarding our wants. And we feel that representation should be made to the Government, so that we may have our rights. This county is the premier mining county in Ontario, in fact, I might say in Canada. And although Cobalt is immensely rich in silver and we hope also in gold, yet as a matter of fact, there is as much or more wealth in sight at the present time in Eastern Ontario and in this county, than Cobalt will ever produce, and when Cobalt has gone the way of all such mining camps, Hastings district cannot fail to be a flourishing mining centre. I do not make this statement out of any doubt about the richness of that section, but I make it from the facts connected with our county. In the first place Cobalt, we know, has some enormously rich silver mines, but in that alone consists her wealth. When they are worked out nothing will be left. Now, what has this district got. In the first place, we have more arsenical ores in the County of Hastings and Addington, than can be found in any other country in the world, and with capital to develop their deposits, we could produce enough arsenic in this district alone to supply the world's demand. And I make this statement knowing what I say to be the fact, that in no part of the Dominion of Canada can such views of auriferous free milling quartz be found as in this county. In the northern part of these townships you can see veins from fifty to two hundred feet wide. At the Craig mine in Tudor there is a vein over three hundred feet carrying free gold. True, the ores are low grade, but all high enough to pay if worked on a large scale. Then there are iron deposits in every township in North Hastings, and no finer iron can be found in the Dominion than in some of the best iron deposits. Look at the mines at L'Amable, owned by Mr. Farham, for which he refused $2,000,000 within the last month. And what about our pyrites? In what part of this continent can they be found in such abundance as in this district. See what the Nickle's Co., of New York, are doing in the township of Hungerford—erecting a plant at a cost of over one million dollars, to treat the products of their own mines. Then we have copper. See what Col. Saunders has been doing with his copper smelter at Eldorado, and Mr. Cushman at Bannockburn, with his lead smelter. And besides these ores we have talc, soap-stone and marbles of every shade and color, sandstones, feldspar, mica, asbestos, actinolite, corundum, cobalt, plumbago, flourspar, lithographic stone, molybdenite zinc, sodalites, celestite, marells, antimony, barite, apatite, fowlerite, and pyrrhotites, besides quarries of granites, gneiss, slate and lime stones. And it is because we have these minerals that we feel some sort of assistance should be given, and we hope that this association will be the means to bring this district more prominently before the public. The question has been often asked why our gold mines have not paid. The question is easily answered. In almost every case it has been the want of money, the want of experience, the want of development, and the cost of power. This is not a poor man's country, it requires capital to develop our mines, and the ores must be treated in large quantities, With two exceptions the largest mills in this district are ten stamp mills. As a rule our ores will not go over $4.50 to $5.50 per ton, although these exceptions in gold, which even with ten stamp mills would pay well, provided we had cheap power. When I tell you that it cost the Gold Fields Co. in the neighborhood of $35,000 to $38,000 per year for fuel, over $80 per horse-power per annum, and the Atlas Arsenic Co., when working the Gawley shaft over $20,000 per year with only a ten-stamp mill, you can have some idea of where the profits go, but now that the Government has taken up the power question, there is no reason if we can get the power at a reasonable cost, but that any one of our gold mines will pay. Of course, we who are in the arsenical district are not depending on the gold product alone, as we have the arsenic as a paying product, and there is every reason to believe that the arsenic mine will be in full blast next summer, provided arsenic holds its present price. Two years ago arsenic was sold in New York at $60 per ton. Now it is worth from $140 to $160 per ton. With our supply of arsenical ores, and the fact that in England where the main supply came from, manufacturing arsenic is a thing of the past, on that account there is good reason to believe that the eyes of capitalists will be directed to this district. In fact, they have got to, as with our gold product which our mispickle ores contain, we can manufacture arsenic

at a cost of $40 less per ton than they could do in any other country. It has also been said by skeptics who know nothing about the conditions of this section, that our pay ores do not continue with depth. I defy any one to show any truth in this statement. The fact is, that in every instance better values are found in the lower workings than on top. It is quite true we have no deep mines. The deepest shaft is on the Gold Fields' property at Deloro, which is in the neighborhood of 500 feet. The ore at this level is richer in arsenic and in gold, than was ever found on top. The same applies to the Cordova at its 400 feet levels, and also at the Gawley and Atlas arsenic mines, as well as at the copper mines at Eldorado, and lead mines at Bannockburn; also the Craig Co. mines in Tuar, and the richest and largest bodies of ore at the Nickle's property in Hungerford township, were found at these present workings between three and four hundred feet, and there has never been an instance on record where a true vein has pinched out in this section; so I may say that any statement of that sort is utterly misleading and untrue. Now, gentlemen, what do we want from the Government? We ask from the Dominion Government that no bounty be paid on pig iron which is smleted in part or in whole from American ores, but that a bounty be paid on iron manufactured from Canadian ores. That there shall be no duty on coal when used for smelting purposes. From the Ontario Government we ask that there shall be no licenses required for prospecting either on Government or private lands in this district; that the mining license system be done away with; that there shall be no bounties on gold ores that do not pay over $20 per ton. We also want that a full list of all the Government lands be placed in hands of the clerks of each township in this district where mine lands exist, so that those wishing to prospect Government lands may know the lots owned by the Government, and we ask that a tax of not less than 20c per acre shall be paid by owners on the mineral rights of properties who do not own the surface rights, and who are not working the properties. As you are aware, in this section thousands of acres are held by speculators who buy up these lands at tax sales. Selling the surface rights and holding the mineral rights for speculative purposes. By doing this the municipalities will get the benefit of this revenue, and they will either have to sell their properties at reasonable figures, or contribute to the revenue of the country. We would also ask the Government that an appropriation be made each year for assisting to build roads to mines that are situated in the unsettled parts of the county. We would also ask that assistance be given or a bounty paid for establishing reduction work for the treatment of pyrite ores, so as to encourage this industry in this section, where there are so many undeveloped pyrite properties. These questions with others on the same lines I hope will be brought up at our future meetings, and I am confident with our united efforts, we can show investors that there is no better field for investment than in this section.

QUEBEC'S MINING AREA.

The following communication has been received:

"While the Province of Ontario is selling the beds of Cobalt lakes for millions in cash, and so forth, the Province of Quebec is permitting speculators to take up vast blocks of the public domain, under "mining license," at five dollars a square mile. Recent discoveries in the Lake Chibougamau district have made it about as certain as anything in regard to mining can be, that this country is going to be a rich mining one, although the public has hardly realize that this is the case, and that we have in our own province a mineralized area, which, if it were served by a railway, would make Cobalt look like a pawnbroker's shop after a pledge sale. Already there is not an acre of rock or swamp in that district that a free prospector can go in on, for ten miles, at least, around Paint Mountain. When the railway is built, as built it must be in the near future, the prospectors must buy the rights to prospect from the gentlemen who hold the mining licenses, not from the province, and the minerals, when found, must be bought, not from the province, but from the same fortune miners, who mine by taking up blocks of, say, ten square miles by getting four lines drawn on an imaginary map, and paying fifty dollars. All this is to be the more regretted because the discoveries in the Chibogamoo district seem to be of such a nature as to lead to the belief that a very profitable, and what is better, a permanent mining industry will in time be established there. Free prospecting cannot now take place, and the indispensable railway cannot now be built with any hope that the mineral discoveries will recoup the expenditure, as must have been the case already in Ontario; for the returns from Cobalt (including the fees on company flotations), must have gone a long way towards paying for the Temiscaming Railway. One thing is certain, the mineral areas in the northern part of this province must be opened up by a railway, and that immediately. How it is to be done is a matter for the Government to decide. It has granted the licenses; it must face the music and the organ men it has fed so splendidly.

"QUEBECKER."

THE COBALT CAMP OUTPUT.

Cobalt ore shipments during the month of January, 1907. Period January 1st to January 12th, 1907:—

Jan. 3, G.T., 21,631, Buffalo Mine to Chas. L. Dennison, Perth Amboy, N.J., 59,000 lbs.

Jan. 4, G.T., 4,673, McKinley, Darragh, & Savage Mining Co. to Balback Smelting & Refining Co., Newark, N.J., 60,000 lbs.

Jan. 7, G.T., 7,802, Coniagas Mine to American Smelting & Refining Co., Perth Amboy, N.J., 62,700 lbs.

Jan. 7, G.T., 9,037, Coniagas Mine to American Smelting & Refining Co., Perth Amboy, N.J., 54,800 lbs.

Jan. 9, C.P., 44,838, Green Meehan to Canada Copper Cliffe, Ont., 61,210 lbs.

Jan. 10, P.R.R., 14,681, O'Brian Mine to American Smelting & Refining Co., Perth Amboy, N.J., 103,000 lbs.

Jan. 10, G.T., 29,806, Nipissing Mining Co., Nipissing Mining Co., New York, N.Y., 40,100 lbs.

Jan. 11, Soo, 25,386, O'Brian Mine to Canada Copper Co., Copper Cliffe, Ont., 64,866 lbs.

Jan. 12, Soo, 18,498, O'Brian Mine to Canada Copper Co., Copper Cliffe, Ont., 64,795 lbs.

Period January 20th to January 26th, 1907.

Jan. 21, N.D., 20,596, O'Brian Mine, Canada Copper Co., Copper Cliffe, Ont., 60,570 lbs.

Jan. 21, G.T., 6,142, Coniagas Mine to American Smelting & Refining Co., Perth Amboy, N.J., 56,720 lbs.

Jan. 21, C.P., 40,870, Cobalt Townsite Mining Co. to Orford Copper Co., Copper Cliffe, Ont., 47,160.

Jan. 22, G.T., 27,309, Buffalo Mine to Chas. L. Dennison, Perth Amboy, N.J., 40,000 lbs.

Jan. 23, G.T., 2,311, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 41,730 lbs.

Jan. 23, L.V., 8,953, University Mine to University Mine, c/o Leeoux Co., New York, N.Y., 61,385 lbs.

Jan. 23, C.P., 24,558, Cobalt Silver Queen Mining Co. to Canada Copper Co., Copper Cliffe, Ont., 38,860 lbs.

Jan. 23, C.P., 147,942, Cobalt Silver Queen Mining Co. to Canada Copper Co., Copper Cliffe, Ont., 86,823 lbs.

Jan. 24, G.T., 25,479, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 40,400 lbs.

Jan. 24, G.T., 24,135, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 42,047 lbs.

Period January 28th to February 2nd, 1907.

Jan. 29, G.T., 3,413, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 60,460 lbs.

Jan. 29, G.T., 13,453, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 60,394 lbs.

Jan. 30, G.T., 14,413, Nipissing Mining Co. to Nipissing Mining Co., New York, N.Y., 61,450 lbs.

Jan. 30, G.T., 28,886, Buffalo Mine, American Smelting & Refining Co., Perth Amboy, N.J., 40,000 lbs.

Feb. 1, G.T., 25,365, Nipissing Mining Co., Nipissing Mining Co., New York, N.Y., 40,180 lbs.

Making a total for this period of 262,484 lbs.

CANADIAN MINING INSTITUTE, ANNUAL MEETING.

The Ninth Annual Meeting of the Canadian Mining Institute, will be held at the King Edward Hotel, Toronto, on March 6th, 7th and 8th, 1907.

The usual single fare rate will obtain over all Canadian transportation lines.

The King Edward Hotel also offer a special reduced rate for members and others attending the meeting.

An interesting programme of papers has been arranged.

Members will be good enough to notify the Secretary as early as possible of their intention to attend.

The Nominating Committee submit, (in accordance with Par. XXVII., Sec. V, of the By-Laws), the following list of nominations to offices falling vacant at the end of the next Annual Meeting.

President—Mr. Frederic Keffer, M.E., Greenwood, B.C.

Vice-Presidents—Dr. J. Bonsall Porter, Montreal, Que.; Mr. W. G. Miller, Toronto, Ont.; Mr. W. Fleet Robertson, Victoria, B.C.

Secretary—Mr. H. Mortimer-Lamb, Montreal, Que.

Treasurer—Mr. J. Stevenson Brown, Montreal, Que.

Council—Mr. E. W. Gilman, Montreal, Que.; Mr. Jas. McEvoy, Fernie, B.C.; Mr. Frank B. Smith, Edmonton, Alta.; Mr. R. W. Brock. Ottawa, Ont.; Mr. J. C. Gwillim, Kingston, Ont.; Dr. F. D. Adams, Montreal, Que.; Mr. H. E. T. Haultain, Craigmont, Ont.; Mr. David H. Browne, Copper Cliff, Ont.

BOOK REVIEWS.

Bulletin No. 28 of the Institution of Mining and Metallurgy, London, E.C., England, has been received. It is replete with papers of interest to mining engineers and metallurgists.

The production of gas, coke, tar and ammonia during 1905 in the United States is given in a pamphlet just issued by the United States Geological Survey. The author is Edward W. Park.

"Land Smelting and Refining, with Some Notes on Lead Mining," is the title of a work that has been issued from the press of the Engineering and Mining Journal, New York. It is a reprint of various articles pertaining, especially, to the smelting and refining of lead together with a few papers bearing on mining of lead ore, taken from the pages of the Engineering and Mining Journal, together with others that have appeared in the Transactions of the American Institute of Mining Engineers. The editing has been done by Dr. W. R. Ingalls, whose intimate acquaintance with this branch of metallurgy, is, of course, well known. The book will be found a most useful work of reference by those having to do with either the smelting, refining or mining of lead ore. The price is $3.00.

The following reports and catalogues have been published by the Geological Survey since January 1, 1906:—

No. 913. The Mineral Pigments of Canada. By C. W. Willmott ((pp. 39). Published February 18, 1906.

No. 914. Supplementary List of Publications during 1904 and 1905 (pp. 11). Published February 20, 1906.

Mineral Production of Canada for 1905 (pp. 16). Published March 15, 1906.

No. 939. Preliminary Report on the Rossland, B.C. mining district. By R. W. Brock (pp. 40). Published June 2, 1906.

No. 923. Report on Chibougamau mining region. By A. P. Low, (pp. 61).

No. 940. Report on Graham Island, B.C. By Dr. R. W. Ells (pp. 46). Published July 20.

No. 888. The Geology and Petrography of Mount Yamaska. By G. A. Young, forming Pt. H. Annual Report, Vol. XVI (pp. 43).

No. 955. French edition of 923 (pp. 57). Published August 2.

No. 947. Summary Report of the Acting Director, for 1905 (pp. 144). Published August 31.

No. 950. Palaeozoic Fossils, Vol. III., Part IV. (and last). By J. F. Whiteaves (pp. 208). Published October 10.

No. 956. Catalogue of Publications (pp. 129). Sent to printer June 11. Signed for printing September 21. Published October 12.

No. 907. Annual Report (New Series), Vol. XIV. (pp. 1193).

No. 911. Annual Report (New Series), Vol. XV., (pp. 1025).

No. 905. "Cruise of the Neptune." By A. P. Low (pp. 355). Published November 19, 1906.

No. 928. Section of Mines, Annual Report, 1904.

The following reports are going through the press:—

No. 902. Report of Brome Mountain, Que. By J. A. Dresser.

No. 942. Report on the Upper Stewart River, Yukon. By J. Keele, and

No. 943. On the Peel and Wind Rivers, Yukon. By C. Camsell.

No. 952. Annual Report (New Series), Vol. XVI., (pp. 733).

No. 958. Annual Report on Chemistry and Mineralogy. By G. C. Hoffmann.

No. 949. Cascade Coal-field. By D. B. Dowling.

No. 961. Reprint of Report on Nickel and Copper Deposits of Sudbury district, Ont. By Dr. A. E. Barlow.

No. 962. Reprint of Report on the Nipissing and Timiskaming region, Ont. By Dr. A. E. Barlow.

The British Columbia Bureau of Mines has issued Bulletin No. 1, 1906, describing the mineral claims on the West Coast, and in the vicinity of Great Central Lake, Vancouver Island. It was written by the Provincial Assayer, Mr. Herbert Carmichael. The groups described are those of the June, and Yreka, and the hematite ore deposits of Quatsino Sound; the Marble Quarry, Stormont, Glengarry, and Texas, on Nootka Sound; Hesquiat Harbour, Indian Chief, and Prince Group on Sidney Inlet; Ormond, near Matilda Creek, Pete and Iron King, Copper King, Nos. 1, 2, and 3 and Ormond No. 2, near Ahousat; Good Hope, Killapa, American Wonder, and Hetty Green, of Clayoquot Sound; Red Rover, Enterprise, Sarita Group; Cascade Southern Group; Happy John Group; Monitor, The Nahmint, Gladys and Edith Group; on Barkley Sound. In addition, the Great Central Lake district is described. It is reached from the town of Alberni by waggon road, 12 miles long; the lake being 200 feet above the sea.

The general trend of the lake is east and west, and it is about twenty-five miles long by a mile or so wide. At its western end two creeks flow in, heading from mountains still farther west. A trail from the lake follows the most northerly of these creeks on a gradual ascent for a distance of ten miles, until it ends in a basin, shut in by high mountains, the basin having here an elevation 1,500 feet above the Great Central Lake, or 1,700 feet above the sea. To the south a precipitous bluff rises 2,075 feet high, from which pours a considerable stream of water that barely touches the rocks until it reaches the bottom, breaking into a mass of spray in its descent. The ascent of the bluff requires stout muscles, and the aid of the small bushes which cling so tenaciously to the clefts in the rock. On the top there is a small rocky plateau, or basin, enclosing a lake about half a mile long by a quarter wide, the elevation of the lake being 3,350 feet above the sea. The mountain lake, situated in the heart of Vancouver Island, with snow-clad mountains rising 2,000 feet above it, and the blue crevassed glacier of the "Nine Peaks" showing up to the south in the morning sun, forms a beautiful scene.

Big Interior Group: This group consists of seven claims, viz.: Big Interior, Nos. 1 to 7, and was located by Drinkwater and Nicholls, of Alberni. The claims are reached from the head of the small lake referred to, by

following up a small second basin, about a quarter of a mile. The head of this second basin is hemmed in on three sides by precipitous cliffs a thousand feet high, on which rests a snow cap, terminating in peaks which are 2,000 feet above the lake below. Practically, this entire face, some 4,000 feet wide by 1,000 feet high, shows the strong red color due to iron stain, while at the base there are thousands of tons of the same rock which have been mined by the action of elements. A closer examination shows this cliff to be a granitoid rock, mineralized with copper pyrites, pyrrhotite, and pyrite in varying proportions, some zones showing strong mineralization, while in others it is more sparse. To the west the rock assumes a brecciated structure and has been cemented together by a filling of calcite, with a considerable impregnation of copper carbonates, and into this zone a tunnel has been driven a distance of 31 feet. The ascent of the bluff is somewhat dangerous, owing to the rather precarious foothold, and the absence of vegetation, the top being reached at an elevation of 1,375 feet above the small lake. From the top of the bluff a snowslide was followed until a further elevation of 500 feet was reached, at which point the ore is uncovered, and shows the strongly mineralized granitic mass which is seen to penetrate a nearly horizontal strata of limestone, alternate bands of which continue to the top of the mountain 500 feet still higher. This sharp ridge, with its altitude of 5,700 feet, may be considered as the backbone of Vancouver Island, shedding the water to the south down the Alberni canal, to the northeast down Buttle Lake and the Campbell River, and to the west of Bear River into Clayoquot Sound.

The mineralized zone, showing in the face of the cliff to the north of the basin, and forming the great mass of low grade mineral on the property, is so large, so inaccessible, and the mineralization so scattered, that it would be impossible to obtain anything approximating an average general sample of the exposure without the expenditure of an amount of time and money not justifiable under the circumstances. However, at the foot of the cliff, there is a talus extending the whole length or width of the mineralized zone, made up of material broken away from the whole face of the zone in question. While this talus may to a certain extent have been affected by weathering, it still may be considered a very approximate sample of the inaccessible cliff. Samples were taken from this talus, from which it is judged that approximately the central portion of the mineralized zone will assay from ½ to 1 per cent. copper, with 1½ to 2 oz. silver per ton, and a trace of gold. These values extend over a width of about 1,500 feet, while to the right of the mineralization gradually fades off into the country rock.

To the left of the mineralized zone is what has been called, for purposes of designation, the "brecciated zone," and which is merely a continuation, to the left, of the mineralized zone which has been subjected to a crushing due to movement and in which the interstices between the fragments of the rock have been filled with secondary minerals, chiefly calcite, with some carbonate of copper, forming a secondary enrichment. This secondary enrichment has taken place, as would be expected, along defined channels, producing streaks of higher grade mineralization often forming commercial ore. Here, again, no general sampling was possible; although a tunnel has been driven for some 31 feet into the bluff, it was found impossible to examine the face of the cliff for 10 feet on either side of the tunnel mouth.

The mineralization just described, and which forms the great bulk of visible mineralization on the property is admittedly very much diffused through the rock, and is consequently so low grade as to be of value only if found to be amenable to some form of concentration, and of which there seems to be a fair probability.

On the top of the mountain, is an area in which the mineralization seems to be more concentrated, producing, in places, ore of a grade to stand transportation and treatment charges. This higher grade ore appears to occur along the lines of contact of alternating bands of granitic rock and limestone. The extent of the latter deposit it was found impossible to determine, as the ore was found to be covered in most places by a heavy capping of gossan, and in many places seemingly permanent snow and ice covered up the formation. While the future of the property is far from being proven, the very great extent of the mineralization, with occasional concentrations, certainly renders the proposition worthy of most careful investigation and prospecting.

Della and Glacier: These claims are situated on the small lake in the Big Interior Basin, and are owned by Drinkwater and Engvik. On the claims is a small quartz vein from 2 to 3 feet wide, mineralized chiefly with arsenical iron. Assays of the straight ore gave the following result:—Gold, 5.12 oz. per ton; silver, 5.2 oz. per ton; copper, 1.0 per cent. The vein has not yet been worked to any extent, but an attempt has been made to extract the values by roasting the ore and grinding in an arastra, which has been erected and is being run by a small waterwheel constructed on the ground.

An examination of the different properties on the west coast of Vancouver Island, especially those on which extensive development work has been done, would point to the following theory as to the mode of ore deposition.

The properties, with the exception of those in Quatsino and Great Central Lake, present nearly identical conditions. The mineralization occurs in or close to diabase dykes. Sometimes there is sufficient quartz in the fissure to make a quartz vein, but more often there is an entire absence of quartz, the vein-matter being the crushed material of the dyke. There appears to have been two periods of movement, the first in which the dykes have formed, when no mineralization took place; the second period in which these dykes were scattered and twisted, when probably secondary dykes of a similar composition to the first series were injected into the fissures found by the movement.

A careful examination of these deposits would lead one to the conclusion that mineralization took place at this time, not as a secondary enrichment, but as a direct deposit by ore-bearing solutions from below. The solid mineral is seen to penetrate what were originally cavities, and to follow along old slip-walls, inside of which, as a rule, no mineral whatever is seen, as would be the case if segregation had occurred. The deposits are often brecciated structure, the ore enclosing fragments of the original dyke-rock, and only occasionally is it seen forming a part of the dyke, and then it would be accounted for as forming part of the second upheaval when the later dykes were formed. Mineralization is found along fractured zones in these diabase dykes, and where these fractures contained cavities for the entrance of mineral-bearing solutions we now have ore-bodies, but where the ground is tight or shows only slight movement little or no ore is found.

Chalcopyrite froms the principal mineral of value, while pyrrhotite is a common mineral, occurring both massive and mixed with pyrite and chalcopyrite, but carrying little or no value in itself. Arsenopyrite occurs in any of the properties, and, as a rule, carries gold values.

While no geological map or extensive examination of this region has been made, the general country rock outside of the mineralized zones appears to be syenite, occurring often as mountains of great size and connected with a series of feslpathic dykes which penetrate the older rocks.

PERSONALS.

Mr. A. A. Talmage has become associated with the Pittsburg-Salt Lake Oil Company, his headquarters being in the Chamber of Commerce Building, Los Angeles, California.

On the evening of January 30, a supper was given to Mr. W. A. Duff, assistant manager of the Canadian Westinghouse Company, Limited, on account of his leaving Montreal to take the position of manager of the Canadian Westinghouse Company's office in Winnipeg.

On Feb. 6, about 60 or 70 members of the Ontario Legislature visited the School of Mines at Kingston, going by special train from Toronto. The School of Mines has asked for an increased grant, and the management were desirous that the members should see the work being done.

Mr. Robert R. Hedley, M.E., has resigned his position of manager of the smelter of the Hall Mining and Smelting Company, Ltd., Nelson, B.C.

Thomas A. Nevins, head of the banking firm of Thomas Nevins & Son, and a party of New York, Philadelphia and Pittsburg capitalists, have been in Cobalt inspecting properties.

Samuel Newhouse, E. P. Earl, W. B. Thompson, and Eugene Meyer, who have been inspecting the Nipissing properties, returned to New York at the beginning of the month.

Col. J. H. Robeson, a mining man of Denver has been secured by President Newhouse as manager of the Nipissing property.

Dr. J. J. Deadman, manager, and Fred. R. Price, secretary of the Abitibi Mining Company, have been in Toronto.

Mr. Geo. S. Wynne has been appointed acting general manager of the Lake Superior Corporation in place of Mr. Sawyer, who has returned to Pittsburg.

MINING NOTES.

A French writer says :—All the known deposits of platinum are becoming exhausted, and the price is going up to a prohibitive extent. In 1876 the metal could be bought for $100 the kilogramme. Four years later it had doubled; in 1901 it had quadrupled, and to-day the price is $1,200 per kilogramme, or twice the price of gold. Even that is for crude platinum. The worked metal is twice as dear again. Considering how many industries are now absolutely dependent upon platinum, the question of replacing it by some really efficient alloy or combination is acquiring vital importance.

NEWFOUNDLAND.

Valuable copper mines, covering an area of nearly a square mile, and situated at St. John's, Nfld., were a few days ago purchased from Messrs. Kawaja Bros., and the other two shareholders, by Mr. T. H. Ryan, representing a number of New York capitalists. The purchase price was $75,000. Sir E. P. Morris, of St. John's, who represented the North Sydney shareholders, transacted the deal. The property is said to be the most valuable of all the many copper areas in the Ancient Colony.

NOVA SCOTIA.

The development work which has been going on at Barrachois for the past few months has resulted in the exposure of an eighteen foot seam of iron ore. The operations have been carried on under the direction of W. F. Jennison, C.E., who leased the areas some months ago.

Samples of the ore were sent to Sydney Mines for analysis. The report from there was that the ore was of an A1 quality, and suited for the purpose of mixing with the Wabana ore in the manufacture of Bessemer pig.

QUEBEC.

Our esteemed contemporary, the Gazette of Montreal, had an editorial on Superintendent Obalski's report for 1905, in its issue of January 31. Better late than never. Yet the readers of the Mining Review read a resume of it in our July issue. The Gazette was more belated than the report.

ONTARIO.

Mr. E. J. Donn has been around Larder Lake for years. Mr. Donn states that about 1,500 persons are now living around the lake, and that about 2,000 claims have been staked.

Native silver is said to have been found forty miles up the Montreal River, in a location about twenty miles distant from Cobalt. It is stated that, in view of this find, the possible silver-bearing lands will be included in a block about twenty miles square.

Mr. Aubin, M.P.P. for West Nipissing, is authority for the statement that there is considerable activity in copper mining around Sturgeon Falls. Prospectors are going in by the dozen and rich veins are being discovered. A short time ago an area of some 480 acres was sold for $300,000.

This week we are able to announce the formation of the "Hugo Von Hagen Exploration Company," with an authorized capital of fifteen million dollars, being divided into three million shares of five dollars each, three-fifths of which are treasury stock, says the Wabigoon Star. This company has secured 51 per cent. of the stock of the Laurentian Gold Mines, Ltd., besides controlling interests in various other incorporations.

Mining Recorder Smith at Haileybury says remarkably rich specimens have been shown him as coming from Larder Lake.

From what can be gathered of the district generally, it would appear that it holds possibilities of becoming an important mining camp. Whether its future is good or bad, there is no doubt but that the district will be invaded this coming summer by a large number of prospectors.

A company has been organized to operate a mine discovered some time ago along Sturgeon Lake, in the Sturgeon Lake gold field district. The mine is reached from St. Ignace, and is 150 miles west of Port Arthur. The company will be known as the Douglas Mining Company, and will have a capital of $500,000. The directors will be Messrs. G. S. Gzowski, John Douglas, J. A. Gaggett, Geo. Laird, Toronto, and James Atwood, of British Columbia.

For the year 1906 the revenue of the Ontario Bureau of Mines reached a total of $250,090. This sum included the first royalty ever collected by the province from those engaged in the development of mineral deposits. This payment, amounting to $15,000, was made by the holders of the O'Brien mine, on a carload of ore shipped in 1905, subject to the outcome of a lawsuit then pending. Later the action was abandoned, and the O'Briens agreed to pay a royalty of 25 per cent. of the value of the ores mined. The aggregate also includes the sum of $108,500, the 10 per cent. payment made on the acceptance of the tender for the purchase of Cobalt Lake. Miners' license fees netted the province $70,000.

In 1905, the receipts reached a total of $61,560, while the appropriation made by the Legislative Assembly for the Bureau of Mines, including salaries for the staff in the office and in the field, and a vote of $25,000 for work in the Gillies limit, was $86,950. The revenue thus exceeds the year's expenditure by $163,140.

At the annual meeting of the Nancy Helen Mines Company, Messrs. W. R. Smyth, M.P.P., Wm. Black, and J. F. Black were respectively re-elected president, vice-president and secretary-treasurer. The reports presented were of a most satisfactory nature. Some work has been done on the 40-acre claim in Bucke township, owned by the company, and it gives promise of being a fine mining property. On the company's mine in the town site of Cobalt work has been and is being steadily continued. This property is numbered among the shipping mines of the district. A shaft has been sunk 82 feet and three carloads of ore are now awaiting shipment. A plant and



Westinghouse Exhibit at St. Louis.

equipment costing $20,000 is being installed, in fact, some of it is already in place. Several new and most promising veins have been discovered on this property quite recently, besides those now being worked. Among mining men in the Cobalt district the company's properties stand high and there has been considerable inquiry of late as to whether the company will make a public issue of stock. The company, it is said, intends to adopt this course some time in February.

A new mining district in Northern Ontario, which threatens to rival the far-famed Cobalt camp, is opening up in the Sutton Bay country, situated in Harris Township, lying eight miles east and one mile north of the town of New Liskeard. The new camp is commonly called the Casey mountain range, and at the present time of writing the showing prognosticates wonderful things for the future of the Casey mines.

The Casey mountain region is identical with Cobalt in formation. The same lower Huronian conglomerate with diabase contact is found to permeate the district, which lies on the edge of a swamp or the former level of Lake Temiskaming in pre-historic times.

The mountain range rises to a considerable altitude and runs east one and one-half miles, and has all been claimed. Native leaf silver in fairly large quantities has been found, and the two mining companies already operating are very much encouraged and expect to run into pay ore within a short time.

The companies operating are the Cobalt Silver Crescent Mining Company and the Bucknell Mining Company. The Silver Crescent Company is in charge of Herbert Murray, a mining engineer of large and varied experience, which has been gathered in California and at Nome, Alaska. Mr. Murray is of a conservative temperament, but even this trait does not prohibit him talking enthusiastically regarding the future of the Casey mountain range. At present the Silver Crescent Company has fifteen men working on the claim, busily engaged in cross-cutting and sinking a shaft to catch several veins of great promise. The several fissures are 4 or 5 inches wide, and carry cobalt ore and native silver. The decomposed cobalt bloom on one of these veins is as fine, if not better, than any in the Cobalt district farther south. The Silver Crescent Company has a nicely equipped camp, and in the early weeks of spring, machinery will be established for working the mine. The Cobalt Silver Crescent Company has a capital of $500,000, divided into dollar shares, and Pittsburg magnates are largely interested in the proposition.

The Bucknell Mining Company, next to the above claim, is working twenty-five men. They are just now erecting an engine and boiler-house, preparatory to establishing an up-to-date plant. A shaft has been sunk 40 feet on the property, and drifting from this centre 60 feet has transpired. The vein followed has a good showing of smaltite, or cobalt, ore and native silver, and recent assays promote confidence for the future in a large measure.

The Casey mountain range is two and one half miles from White River, a waggon road making transportation easy and quantities of wood and water abound for mining purposes.

COBALT.

The last car shipped from the Foster mine will, it is said, run over $58,000. "This is the richest yet shipped," says General Manager Adler.

It is rumored on the street that the negotiations in connection with the amalgamation of the Peterson Lake Company and the Nova Scotia are about completed.

The Nancy Helen Mines Company, which owns forty acres in Bucke Township, reports that a shaft has been sunk 82 feet, and that three car loads of ore are ready for shipment. A plant costing $20,000 is being installed.

The Coniagas people have commenced work on a 5x7 shaft in the Imperial Bank lot opposite the Prospect Hotel. There is known to be under the butcher shop to the north an important vein of ore, and it is the intention of the Coniagas to crosscut to this.

It is reported that McKinley-Darragh-Savage has declared a dividend of 2c monthly, equivalent to 24 per cent. per annum, on its 2,500,000 shares of $1 par value. No official announcement of a dividend has, however, yet been made, and local interests say they have not heard of it yet, though the mine has made some exceedingly rich shipments lately.

A report to Green-Meehan directors has just been received from Mr. C. A. O'Connell, manager, in which he gives the following figures: Number of days worked 53; average number of men employed, 35; number of tons of ore extracted, 47; actual cost of producing ore, $4,349.62; actual cost of production, per ton, $92.55; estimated value of ore shipped, $87,340.

Word has been received from Cobalt that an effort is being made to induce the settlers there to remove to Upper Cobalt, on Lake Temiscaming, a distance of about one and a half miles from the present site. The advantages of the new situation are that the site is much better, being on a gentle declivity, which slopes down to the lake. More sanitary conditions obtain, and good water can be secured. Upper Cobalt, it is also claimed, can be converted into a good summer resort.

Two shafts have been sunk on the eastern shore of Cobalt Lake by the Cobalt Lake Mining Company and calcite bloom has been discovered and some free silver obtained.

The draining of the lake will not be proceeded with for some time. The town of Cobalt, it is thought, might protest against the cutting off of the supply of water for fire protection purposes.

The proposition is to empty the lake by means of syphons and pumping plants.

At the second annual meeting of the Silver Leaf Mining Company, held January 30, in Toronto, the following were elected officers and directors for the ensuing year: President, Mr. A. G. Browning, North Bay; treasurer, Mr. A. E. Osler, Toronto; managing directors, Messrs F. B. Chapin and Frank Culver; directors, Messrs. S. C. Smoke, Toronto; Geo. L. Walker, Boston; John R. Stanton, New York; J. H. Rice, Houghton, Mich.; W. S. Pickett, Michigan, and Mr. Wm. D. Elwell, Boston.

Mr. E. T. Corkhill, provincial inspector of mines, Toronto, has returned to Toronto from the Gillies limit, where he has had charge of the operations of the government mining party.

He reports that work on the discovery reported some time ago is progressing steadily at the seventy-foot level, and that the ore body is showing up splendidly. In reply to a question as to whether they were shipping yet, he said that it had not been decided to do so yet, although they had lots of rich ore on the dump ready to do so. He states that all indications point to a great rush of prospectors into the Larder Lake district, when the spring opens.

A contract was signed recently between the financial agents of the Central Mines Company, Messrs. Thomas Nevins & Sons, and the Traylor Engineering Company, under which the latter is to supply the complete equipment for a 100-ton concentrator for the Cobalt-Central properties. This will be the first concentrator to be built in the Cobalt region. The crushers, rolls, rigs, concentrating tables, power house and elevators will be shipped as speedily as possible. The plant will enable the company to ship concentrates that will run high in silver. The company will also be able by this means to get full value for its shipments, as it will be able to carefully sample the same and know the average value before they are shipped, which is not possible to do on any shipments made from Cobalt as matters stand to-day.

R. Meeks, in The Engineer and Mining Journal, makes the following statements in a write-up of Cobalt:

It may be of interest to mention the final disposal of the ore from this district. While there are rumors of a smelter being built near the mines for the treatment of their ores, still, so far as can be ascertained, they are only rumors. Experiments are being conducted at Hamilton, Ont., which are said to be successful, and, moreover, it is claimed that mine-owners of Cobalt are financially interested in the venture. But at present all the ore is treated in three smelters, and must be hauled a long distance, and at considerable cost.

From the correspondence which I saw at Cobalt, the following smelter charges were derived: The American Smelting & Refining Company agrees to pay for 94 per cent. of the silver contents, and charges a flat rate of $10 per ton. The terms are cash immediately after the agreement of assays, and no payment is made for nickel, cobalt, or arsenic values. The matte containing the nickel and cobalt becomes the property of the smelters, and it is claimed that this is shipped to Saxony, Germany, for treatment. The shipper must also pay a sampling charge of from $5 to $6 per ton, and the freight charge, which amounts to $10.20 per ton. This charge is divided as follows: From Cobalt to North Bay, $3.20; from North Bay to New Jersey points, $7.

The Balbach Smelting & Refining Company of Newark, N.J., has a sliding scale, as follows:

Ore containing 400 oz. silver, $6; 400-500 oz., $5; 500-600 oz., $4; 600-700 oz., $3; 700-800 oz., $2; 800 oz., or more, no charge.

They agree to pay for 93 per cent. of the silver contents at New York market prices on the day of contract, settlement to be made 14 days after agreement of assays, or 1 per cent. less for cash. In this case, also, the shipper pays for sampling and freight charges as before.

Corroborated particulars relative to the charges made by the Canadian Copper Company, at Copper Cliff, were not available, but they are said to be as follows: The smelter makes no charge for smelting or sampling, and agrees to pay for 93 per cent. of the silver contents at market rates, and also agrees to pay for cobalt, providing it is in excess of 15 per cent., and that the nickel values are low. The freight charge to this smelter from Cobalt is $5.20, or practically one-half that charged to New Jersey. There is, besides, a direct saving of $5 to $6 for sampling, depending upon the value of the ore. In some districts a freight and treatment charge of possibly $25 per ton would be the determining factor between profit and loss.

BRITISH COLUMBIA.

The management of the Jumbo mine have decided to expend $75,000 in working this property, and the mine will be opened by a shaft of several hundred feet depth.

The total shipments of Rossland ore for 1906 were 277,361 tons, which is less than in 1905. The falling-off is due to a strike of the employees of the Crow's Nest Coal Company. At an estimated value of $12 a ton, the total output is worth $3,338,332. Since 1894 the total output has been 2,592,254 tons, valued at $36,728,480. The best shippers last year were the Le Roi and Centre Star which produced 126,396 and 114,500 tons of ore respectively.

On the White Bear mine drifting and diamond drilling has been done on the 800-foot level, and drifting and cross-cutting has been kept up on the 700-foot level. There has also been drifting on the 1,000-foot level. The most important find was made on the 700-foot level, when a shoot of ore 20 feet wide, and of good grade, was uncovered. About 1,350 tons of second-class ore has been run through, the plant producing 1,350 tons of concentrates. During the year 570 tons of raw ore were shipped.

The reports for the year show that the Central Star and its allied mines have much improved. The holdings of this company were increased by the purchase of the Idaho and the Iron Mask properties. The workings of the Iron Mask have been connected with those of the War Eagle and Centre Star by drifts and cross-cuts, which makes it possible to bring its ore out above its 450-foot level through the connections made between the 400-foot level of the War Eagle and the 350-foot level of th Centre Star. Considerable surface work has been done on the Centre Star, and its related properties and a large crusher having a capacity of 1,000 tons a day, and a 700-horse power motor have been installed. About 350 men are employed.

On the Le Roi mine is a staff of 325 men. A cross-cut has been driven through the dike, which runs across the western end of this mine, and ore bodies of good grade have been discovered on the west side of the dike. The western section has been opened on 800, 900 and 1,000 feet levels, and the workings have been extended 250 feet west of the dike. About half the tonnage which is now being shipped is from this portion of the mine. The explorations at the 1,200-foot level have resulted in the finding of a good shoot of ore, and by extending a winze from the 1,350-foot to 1,750-foot level, large ore bodies have been revealed. A contract has been let to sink the main shaft down below the 1,350-foot level.

The gross shipments of ore from the Le Roi-Tevo mine were 21,000 tons; of a gross value of $24 per ton, and the concentration milled 10,500 tons of second-class ore at a value of $3.50 per ton. The concentrates were worth from $25 to $30 per ton.

COAL NOTES.

The approximate output and shipments for the month of January of the Dominion Coal Company were as follows: Output, 252,108; shipments, 165,215.

One thousand union men went out on strike on February 4, at No. 3 colliery of the Nova Scotia Steel Company at Sydney Mines. The men refuse to work with non-union men, of whom there are about one hundred employed at the mines. The trouble, which has been brewing for some time, is purely between the men themselves, the company having absolutely nothing to do in the matter. For some time the union men have been trying to induce their non-union friends to join the association, but without success. At a meeting of the Pretoria Lodge, held on Saturday night, it was decided to quit work on February 4, in the event of their demands not being acceded to. All the prominent P.W.A. officials are now on the spot. The mine has been closed down.

General Manager Brown, in an interview stated that, for his own part, he did not think the company would interfere in the matter. The company cannot compel any man to join the union. They must treat all employees alike. On the other hand, the miners claim the company must discharge the non-union men or close down the mine.

The P.W.A. held a session of their lodge from 1.30 this afternoon until 10 o'clock to-night, when the entire situation was considered.

Nothing could be learned as to the conclusion reached, as it was decided not to divulge anything until to-morrow.

The Nova Scotia Steel Company has a large quantity of coal banked.

THE MINING AND INDUSTRIAL SHARE MARKET.

(Specially reported for the CANADIAN MINING REVIEW by ROBERT MEREDITH & Co., Mining Brokers, 57 St. François Xavier St., Montreal.)

Active interest in mining shares has not yet become evident, the market has been dull all the month for mines as well as other securities. The monetary situation and great congestion of general trade, is no doubt to a considerable extent responsible for the condition, but there is evidence that with the advent of spring active operations will be commenced in many camps, and it is probable that the production of precious metals this year will far exceed any previous one in the history of the Dominion.

In industrial shares the same condition prevails, and while most of the companies are showing good returns and doing a profitable business, the demand for the stocks is limited, and in consequence prices are irregular.

The latest quotations are as follows:—

	Bid.	Asked.
Consolidated Mines	135	140
Can. Gold Fields	6¼	7¼
Granby Consolidated	139	140½
Rambler-Cariboo	25	27½
North Star	10	20
Monte Christo	2	3
White Bear	8½	10
California	4¼	6½
Virginia	6½	8
Deer Trail	...	2
International Coal	60	63½
Sullivan	7½	9
Cariboo-McKinney	3½	4½
Denoro	10	15
Diamond Vale Coal	33	35
Alberta Coal and Coke	30	32
Dominion Copper	6¾	7
Novelty	2½	3½
Nipissing	11¾	12
Foster	2¼	2½
Silver Queen	2⅛	2¼
Trethewey	1⅝	1⅞
Kerr Lake	4¼	5¼
Silver Leaf	20	20½
Green-Meehan	140	150
Peterson Lake	50	51
Dominion Coal (com.)	6½	63
Dominion Coal (pref.)	...	...
Dominion Iron & Steel (com.)	21	21¼
Dominion Iron & Steel (pref.)	56½	59
Intercolonial Coal (com.)	...	...
Intercolonial Coal (pref.)	...	...
Nova Scotia Steel & Coal (com.)	69	70½
Nova Scotia Steel & Coal (pref.)	...	...

INDUSTRIAL NOTES.

Messrs. F. H. Hopkins & Co., are sending out a very artistic postcard, showing the 1907 model Ransome concrete mixer in operation.

The Gutta Percha and Rubber Manufacturing Company, of Toronto, Limited, state that their company is not in any way, shape or manner, a part of, or connected with any rubber merger or trust.

That more gold lies in the bosom of that far-north country than has ever been brought out of it is a fact which the public, in its usual carelessness, seems to have lost sight of completely. It seems to think because there's no more mad rush, there's no more gold.

But there are men here and there who are not content to let the precious metal stay up there any longer than they can help. One of the firms actively interested is The Yukon Consolidated Goldfields Company, Limited. Believing that the best aid they can have up there is electricity, they have purchased a large supply of apparatus from The Canadian Westinghouse Company. They will use this apparatus in dredging.

There is no doubt that electric power will be the most effective and least expensive in the end. And the operations of this company will be watched with interest.

The phenomenal growth of the use of concrete construction during the past two years has carried with it an equally augmented demand for finely crushed stone.

A few years ago the "screenings," a product of a stone crushing plant of a size of ¾ in. and less, was considered waste, while in a great many localities there is now the greatest demand for this size of product. Finely crushed stone is required for many purposes for which it was formerly considered unsuited.

In order to meet this new demand for finely crushed stone, the Allis-Chalmers Company, represented in Canada by the Allis-Chalmers-Bullock, of Montreal, has designed for the Gates Rock and Ore Breaker a short type of head and concaves, by the use of which the desired product may be obtained. An illustrated bulletin on this subject is now in preparation in which it is shown that the builders have not departed from the accepted standards of the Gates Breaker, the only changes being a simple substitution of the crushing parts. With the short head and concaves, the head is made shorter and of larger diameter than in the case of the standard length head.

This type of breaker has been used with excellent success when a fine product is desired from the machine, and when the stone fed into the breaker is of a comparatively small size.

It has also been used to equally good advantage as a rejection crusher when a fine product is desired and when the stone fed in is principally slabs and spalls from a larger machine which have been rejected by the screen.

The short head and concaves are fitted to either style D or style K Gates Breakers. The machine may be fitted with either the chilled iron head and chilled iron concaves, or manganese steel "gunlock" mantle and cast iron centre and manganese steel concaves.

A new double drum electrically driven hoisting engine built by the Lidgerwood Mfg. Company for the Inca Mining Company, which was shipped recently, will have to travel over an interesting and complicated route before it reaches its destination beyond the summit of the Andes in Peru and be set up for use.

The Santo Domingo Mines, for which the hoist is destined, lie in the old dominion of the Incas in Peru and behind the Lake Titacaca region where the Spanish conquerors found such stores of precious metals.

The Santo Domingo Mines were discovered about twelve years ago by a couple of Peruvians who had wandered across the summit from Arequipa in search of placer gold. Suddenly they discovered a vein of gold-bearing ore where a landslide had uncovered the native rock. A year later the property was acquired by a party of men of Bradford, Pa., and the Inca Mining Company and the Inca Rubber Company were formed. Besides the mining property the Bradford men have a concession of about one million acres of rubber producing lands which they are developing. Work on the mines was begun about eleven years ago, and more than two and a half million dollars worth of gold has been taken out up to this time. The company has about thirty miles of tunnels, shafts and drifts opened up.

The hoist which is now on its way is to be placed in a tunnel which has been run 1,700 feet into the mountain, cutting the vein 1,500 feet below the outcropping, at the top of the hill. A 500-foot-deep shaft has been sunk from the tunnel, and the new hoist is to bring the ore from the lower workings to the tunnel level. Accompanying the hoist are two 200 kilowatt General Electric generators. These will furnish current generated from a water power to operate the hoist, mill and other machinery of the mine. The mill contains 10 stamps, a concentrating and a cyaniding plant. The hoist will go by steamer to the port of Mollendo. From there a railroad will take it to Tirapata in the Lake Titicaca region. There the Inca Mining Company will receive it and carry it 150 miles over roads of its own building, to the mine. The first part of the way for 100 miles is over a waggon road. This reaches to the summit of the Andes at Lake Arracoma, 16,000 feet above the sea level. The next 50 miles is only a mule road. To make it possible to transport the big hoist over this part of the route it was built in sections, with no one piece weighing more than 300 pounds. The total weight of the hoist is 13,800 pounds. The drums are each 48 inches in diameter with 40 inch faces. The hoist is designed for a duty of 3,000 pounds, to be lifted at a rate of 400 feet per minute. It is driven by a 37 horse power induction motor of the General Electric Company's make, and operated by a 440 volt alternating current.

The power house is about a mile away from the mill. It is intended to develop about 250 horse power at first, and this can be doubled by adding another standpipe. The mine lies at an elevation of 5,000 feet above the sea. Beyond the mine the company has built a road about 75 miles long to the Tambopata river, where it is now putting together a little steel-hulled steam boat for navigating the Tambopata, Madre de Dias and Beni rivers. At the crossing of the Irambari river the road is carried by a wire rope suspension bridge, 320 feet long. Telephone lines 250 miles long, belonging to the company, connect the mines with the railroad and points where work is being prosecuted.

Safety Blasting Fuse was invented in 1836 by the late Wm. Bickford, of Cornwall, England, and the firm of Bickford, Smith & Co., Ltd., are his successors. White Jacket Fuse is their latest production, and takes the place of Blue Jacket Fuse, which was introduced into South Africa and Australia four years ago, and into Canada quite recently by Mussens Limited. The blasting fuse, which is ordinarily used all through the Dominion of Canada at the present time, is white countered gutta percha. One of the properties of gutta percha is that, on keeping for several months, it perishes, and owing to this property, it has always been necessary to be sure that gutta percha fuse was fresh from the factory, or at any rate not more than six months old, in order that it might be perfectly safe in wet ground. If the gutta percha has perished in any way, the fuse is very likely to crack and let damp into the powder, which would prevent the fuse burning through to the end, which would cause one of those misfires, which frequently lead to serious loss of life. In the White Jacket Fuse the water-proofing is put on twice with a special black varnish, the composition of which is the property of Bickford, Smith & Co., and which no one else has yet been able to successfully copy.

White Jacket Fuse will stand twenty-four hours immersion in water, and this is far more than is ever required in practice. Instead of having to be used as soon as possible after leaving the factory, it can be kept for one or two years without in any way deteriorating, and is of great importance in the case of a commodity like fuse, which is held in stock by dealers in different parts of the country, making it almost impossible for the customer to tell how long the stock has been held. Besides these special qualities, the burning speed of the fuse is every regular, and is guaranteed to vary less than ten per cent. on either side of the standard. It also stands rough handling and rapid changes of climate and temperature better than any fuse which has ever been on the market in Canada before.

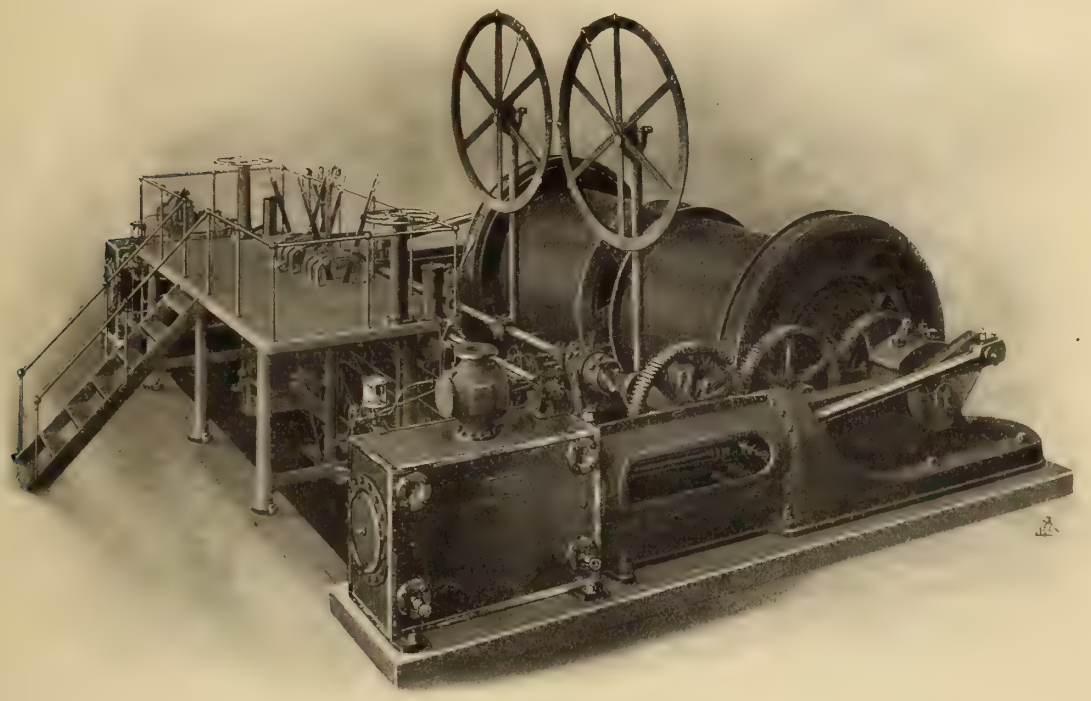
The Hancock Cons. Copper Co., Mr. John L. Harris, Supt., whose mines are located at Hancock, Mich., has recently ordered from the Sullivan Machinery Co., of Chicago, a hoisting engine to be used for sinking the principal shaft and for permanent service, after the shaft is completed to its final depth of 4,000 feet.

This hoist will be of the first motion, heavy duty, Corliss type, with engines 24 in. diameter by 48 in. stroke, and two loose drums, 8 feet in diameter by 9 feet long, driven by band friction clutches, and designed for hoisting in balance. The drums will be grooved for 1 1-4 in. steel rope, and the maximum hoisting speed under full load will

be 3,500 feet per minute. The clutches and band brakes will be steam operated, with automatic compressed air substitution, in case the steam pressure falls below a given point, owing to accident or for other reasons.

This hoist will be furnished with the Sullivan patented automatic throttle closing device and interlocking automatic stop. By these contrivances, the steam will be automatically shut off at a fixed distance from the top of the shaft, allowing the engineer to bring the cage to a stop at the desired point, by use of the brake. In case the engineer, for any reason, fails to set the brakes, they will be set automatically at the proper point, to prevent an overwind.

Hoists of this same design have recently been furnished to the Republic Iron & Steel Co., Republic, Mich., the Ironton and Colby Mines, Bessemer, and the Dunn Mine, Crystal Falls, Mich.



Sullivan Hoisting Engine, Ironton Mine.

MINING INCORPORATIONS.

ONTARIO.

Mines, Limited. Capital, $40,000, divided into four hundred shares of one hundred dollars each. Head office, Toronto, Ont. Provisional directors: W. H. Moore, Gerard Ruel and Geo. F. MacDonnell, all of Toronto, Ont.

Cobalt Gem Mining Company, Limited. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: J. E. Day, J. M. Ferguson, E. V. O'Sullivan and Mary Donevan, all of Toronto.

Silver Horse Shoe Cobalt Mining Company, Limited. Capital, $40,000, divided into forty thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: Jos. Brown, Neil Sinclair and A. M. Harley, all of Toronto, Ont.

Kennedy Cobalt, Limited. Capital, $1,000,000, divided into one million shares of one dollar each. Head office: Toronto, Ont. Provisional directors: W. H. Jackson and J. A. Morden, of Toronto, Ont., and David Kennedy, of Toronto Junction, Ont.

The Silverford Cobalt Mining Company, Limited. Capital, $200,000, divided into two hundred thousand shares of one dollar each. Head office: Toronto, Ont. Provisional directors: T. H. Barton, F. D. Byers, and O. F. Taylor, all of Toronto, Ont.

The Jack Pot Cobalt Silver Mining Company, Limited. Capital, $750,000, divided into seven hundred and fifty thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors: R. S. Gilpin, D. A. Rose and F. T. Whittemore, all of Toronto.

Quebec Cobalt Mining Company, Limited. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: J. E. Day, J. M. Ferguson, E. V. O'Sullivan, J. H. Hallett and Mary Donevan, all of Toronto.

Duluth Cobalt Mining Company, Limited. Head office: Haileybury, Ont. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Provisional directors: J. F. Gillies and J. F. Hope, of Toronto, and John Mackay, of Sault Ste. Marie, Ont.

The Cobalt Mutual Mines Company, Limited. Capital, $100,000, divided into one hundred thousand shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: Arthur G. Slaght, Hugh LeRoy Slaght and Wm. Henry Phelan, all of Haileybury, Ont.

Montreal Cobalt Power Company, Limited. Capital, $1,000,000, divided into ten thousand shares of one hundred dollars each. Head office: Toronto, Ont. Provisional directors: J. W. Bain, G. B. Strathy, R. R. Perry, L. C. Todd, and J. E. Riley, all of Toronto, Ont.

Cobalt Mines Syndicate, Limited. Capital, $100,000, divided into one hundred thousand shares of one dollar each. Head office, Toronto, Ont. Provisional directors, J. E. Day, John M. Ferguson, E. V. O'Sullivan, James H. Hallett and Mary Donevan, all of Toronto.

London-Cobalt Mining Corporation, Limited. Capital, $2,000,000, divided into two million shares of one dollar each. Head office: Toronto, Ont. Provisional directors: Geo. Stevenson, F. H. Potts, J. W. McDonald, E. Gillis, and Eva Lena Bradley, all of Toronto.

The Cobalt Ore Sampling Company, Limited. Head office: Cobalt, Ont. Capital, $100,000, divided into one hundred thousand shares of one dollar each. Provisional directors: W. H. Fletcher, G. W. Parker, C. H. Moore, G. A. Woodward and George Ross, all of Cobalt, Ont.

Independence Cobalt Silver Mines Company, Limited. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Toronto, Ont. Provisional directors: W. M. Williams, Joplin, Missouri; C. E. Mabon, of Lewiston, New York, and C. E. Loomis, of Attica, N.Y.

The Sharpe Lake Cobalt Silver Mining Company, Limited. Capital, $1,000,000, divided into one million shares of one dollar each. Head office, Ottawa, Ont. Provisional directors: J. E. Murphy, W. Abbott, of Cobalt, Ont., and W. R. Bradbury, W. E. Matthews and R. G. Code, of Ottawa, Ont.

The Bucke Silver and Cobalt Mining Company, Limited. Capital, $300,000, divided into three hundred thousand shares of one dollar each. Head office: Ottawa, Ont. Provisional directors: F. A. Heney, Nepean, Ont.; H. Hopp, E. L. Horwood, T. A. Beament and John L. MacLaren, all of Ottawa, Canada.

The Cobalt and Larder Lake Gold Mining Company, Limited. Capital, $300,000, divided into three hundred thousand shares of one dollar each. Head office: New Liskeard, Ont. Provisional directors: Geo. C. Legge, Norman Bingham Strong, W. J. Egan, J. J. Kelly, and H. D. Graham, all of Haileybury, Ont.

The Youngstown-Cobalt Silver Mining Company, Limited. Capital $1,000,000, divided into one million shares of one dollar each. Head office: Cobalt, Ont. Provisional directors: Geo. Albert Baker, Youngstown, Ohio; Walter A. Sadler, and D. H. Granville, of Cobalt, Ont., and G. W. P. Hood, of Toronto Junction, Ont.

The Casey Mountain Cobalt Mining and Development Company, Limited. Capital, $250,000, divided into two hundred and fifty thousand shares of one dollar each. Head office, Haileybury, Ont. Provisional directors: R. B. Fergusson, R. G. Williamson, Geo. A. Pollard, David A. Reid, all of Regina, Saskatchewan, and David Williamson, of Haileybury, Ont.

BRITISH COLUMBIA.

The Bay Gold Mining Company, Limited. Capital, $200,000, divided into two hundred thousand shares of one dollar each. Office in Yale District, B.C.

The Old Dominion Copper Development Syndicate, Limited. Capital, $35,000, divided into thirty-five thousand shares of one dollar each. Office, Kamloops, Yale District, B.C.

CATALOGUES.

The Atlas Engine Works, of Indianapolis, have issued Bulletin No. 134, showing the various engines and boilers manufactured by the Atlas Engine Works. The headquarters of the company are at Indianapolis.

Catalogue A describes the Butters Patent Filter. This will thoroughly filter and wash slime at a minimum cost, and will handle slimes that cannot be treated by any other method. The sales agents are The Blaisdell Company of Los Angeles, Cal.

"Everlasting," is the title of Catalogue No. 16, issued by Wendell & MacDuffie, 26 Cortlandt street, New York. This firm makes asbestos shingles, slates and sheathing, made wholly of mineral fibre, asbestos, and the best Portland cement obtainable.

The Report of the Board of Trustees and of the State Mineralogist, California State Mining Bureau, have been issued to cover the fiscal year ending January 30th, 1906. The total value of the mineral production of California during that period was $43,069,227.

A useful article in a prospecting outfit is a No. 10 forge; height 31 inches, width, 18 x 18 inches, weight, 125 lbs. They claim that if one of these forges should fall 20 feet its appearance might be spoiled, but it would be ready for business. Mussens Limited keep them in stock.

Mussens Limited send us a pamphlet descriptive of the Reading Multiple Gear Chain Hoist, capable of handling weights of from 1,000 to 40,000 lbs. Also some descriptions of hoisting machines manufactured by Marsh & Henthorn, of Belleveille, Ont., for which Mussens Limited are the agents.

The Sullivan Diamond Core Drills are known the world over, though some interesting details may be gained, even by experienced men, from Catalogue No. 5, issued by the Sullivan Machinery Company, Railway Exchange Bldg., Chicago. It leaves very little to be said about the Sullivan Diamond Drill.

The Hathorn Works of the Western Electric Company are adequately described in a well illustrated pamphlet issued by that company. A map showing the positions of the different branches of the Western Electric Company, may be found useful by those wishing to procure electrical apparatus and supplies.

Catalogue No. 1, issued by the C. L. Hathaway Rock Crusher Company, Denver, Col., is descriptive of the Gyratory Rock and Ore Crusher manufactured by that firm. Every part of the crusher is shown, and a very full description of its mechanism, and the mechanical principles involved is included.

"The Diamond Drill and its Work" is the title of Catalogue No. 26, issued by the American Diamond Rock Drill Company, 95 Liberty street, New York City. Anyone having drilling to do would do well to procure a copy of this pamphlet before deciding where to order. Several of these drills are in use in the regions about Cobalt and Sudbury.

"Westinghouse Motor Applications" this month treats of A.B.C. Disk Fans. The introduction to this pamphlet states that ventilation is a subject that can never receive too careful consideration—a statement with which our readers well agree most thoroughly. Westinghouse motors from .25 to 2.85 h.p. are suitable for driving fans 18 inches to 60 inches in diameter. The Canadian Westinghouse Company will be pleased to send this pamphlet to all enenquirers.

Westinghouse Motor Applications, is the name of a little booklet issued by the Westinghouse Electric Manufacturing Company of Chicago, represented in Canada by the Canadian Westinghouse Company, Limited, whose general offices and works are at Hamilton, Ont., with branches in Toronto, Vancouver, Winnipeg, Montreal and Halifax. This publication deals with the use of the small power motor for blacksmiths and blowers. Small motor powers are to-day replacing hand drive with even greater success than has been attendant upon the replacement of other forms of power drive by the larger types of motors.

THE CANADIAN MINING JOURNAL

VOL. I. No. 1, New Series TORONTO and MONTREAL Old Series, Volume xxviii. No.



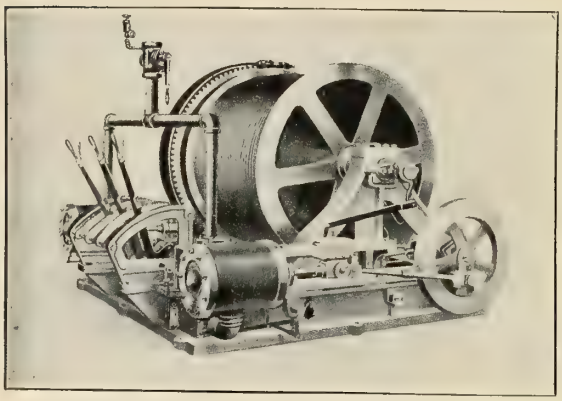
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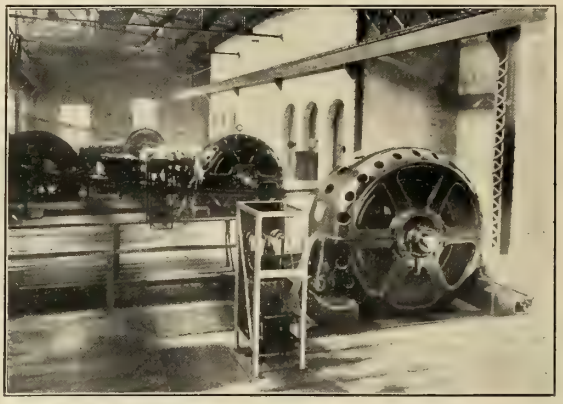
(See Page 7

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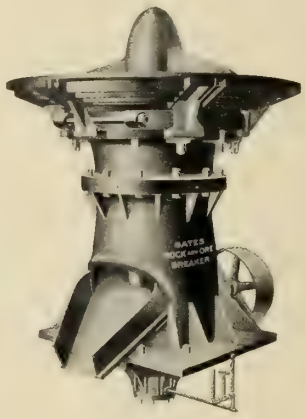
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SECRETARY OF THE CANADIAN MINING INSTITUTE.
BUSINESS MANAGER:
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WITH WHICH HAS BEEN INCORPORATED
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MONTREAL
171 ST. JAMES STREET

BRANCH OFFICES:
HALIFAX, N.S.
VICTORIA, B.C

CONFEDERATION LIFE BLDG.

TORONTO, ... 190

Dear Sir:-

This letter accompanies the first number of a new fortnightly journal devoted to Canadian Mining, Metallurgy and kindred subjects. With the new publication is incorporated the "Canadian Mining Review," a monthly which has been for twenty-three years the leading mining journal of the Dominion.

The AIM of the publishers is to provide a paper that will effectively cover the entire field of mining in the Dominion, and special effort will be made to publish reliable information at first hand. To that end a staff of responsible and properly qualified correspondents has been engaged in the respective mining provinces and districts. In addition many of the most eminent engineers, metallurgists and geologists have consented to act as special contributors.

The POLICY to be adopted in the editorial conduct of the new paper will be such as to ensure the respect and approval of all those engaged or interested in the promotion of legitimate mining in this country. Neither fear nor favor will influence the tone of the editorial comment on men and affairs, and an honest endeavor will be made to protect the public against company frauds and misrepresentations. At the same time it is hoped to maintain that happy mean, where fact will be presented without the tinge of either undue optimism or unnecessary pessimism.

Each issue of the Journal will be well illustrated, and, with a view to advertising the mineral resources of Canada, representative minerals, reproduced by the three-color process, will appear on the front cover from issue to issue.

In short, it is proposed to publish a well-printed, well-edited and well-informed fortnightly Mining and Metallurgy paper, and to establish thereafter a reputation for intelligence and honesty of purpose.

With this brief explanation the publishers solicit your support and co-operation, and would request in particular that you sign and return the attached subscription blank. Should you already be a subscriber, however, they would ask you to be good enough to hand this letter with your recommendation to a friend or colleague interested in Canadian mining, or to whom a publication of the character now contemplated would be likely to appeal. It is also desired to place the Journal in all Libraries and Reading Rooms in the Dominion, and anything you can do in promoting this purpose in your own locality will be very highly appreciated.

Yours very truly,

J. J. Harpell

Business Manager



190

To the Publishers of The Canadian Mining Journal,
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Enclosed you will find the sum of Two Dollars, for which send me "The Canadian Mining Journal" for one year (or one dollar, for which send me "The Canadian Mining Journal" for six months).

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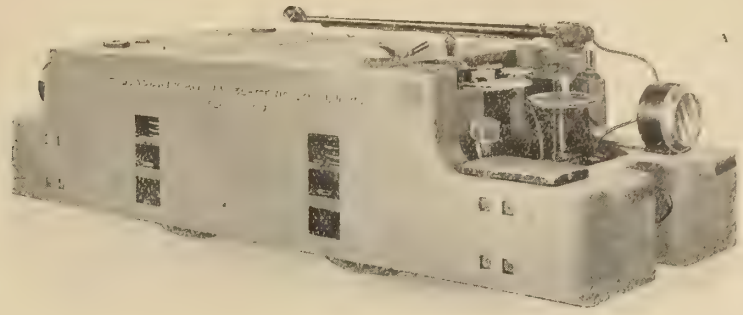
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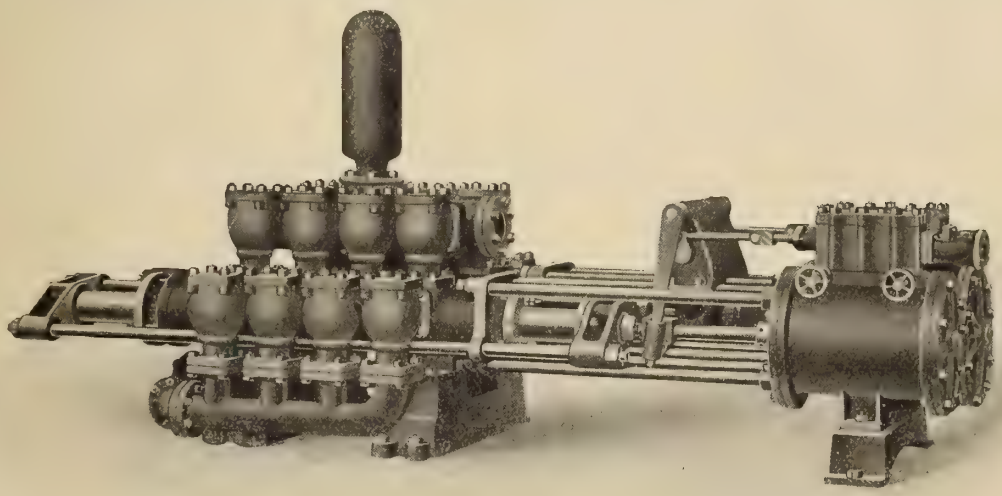
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SYNOPSIS OF CANADIAN NORTH-WEST MINING REGULATIONS

COAL—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

A person 18 years of age or over having discovered mineral in place, may locate a claim 1,500 feet x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

A free miner may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each miles of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

W. W. CORY,

Deputy of the Minister of the Interior

Ontario's Mining Lands

The Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The allied metal, cobalt, is also found in Ontario in unsurpassed quantities.

The output of iron, copper, nickel, silver and cobalt in 1906 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HON. FRANK COCHRANE,
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The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows :

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre ;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel, and also graphite, asbestos and phosphate of lime ; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions : The full price must be paid in cash ; specimens must be produced and accompanied by an affidavit ; a survey at the cost of the applicant must be made on unsurveyed lands ; work must be bona fide begun within the two years.

Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey, 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines at Quebec, under the direction of the Superintendent of Mines, will give all the information asked for in connection with the mines of the Province of Quebec, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

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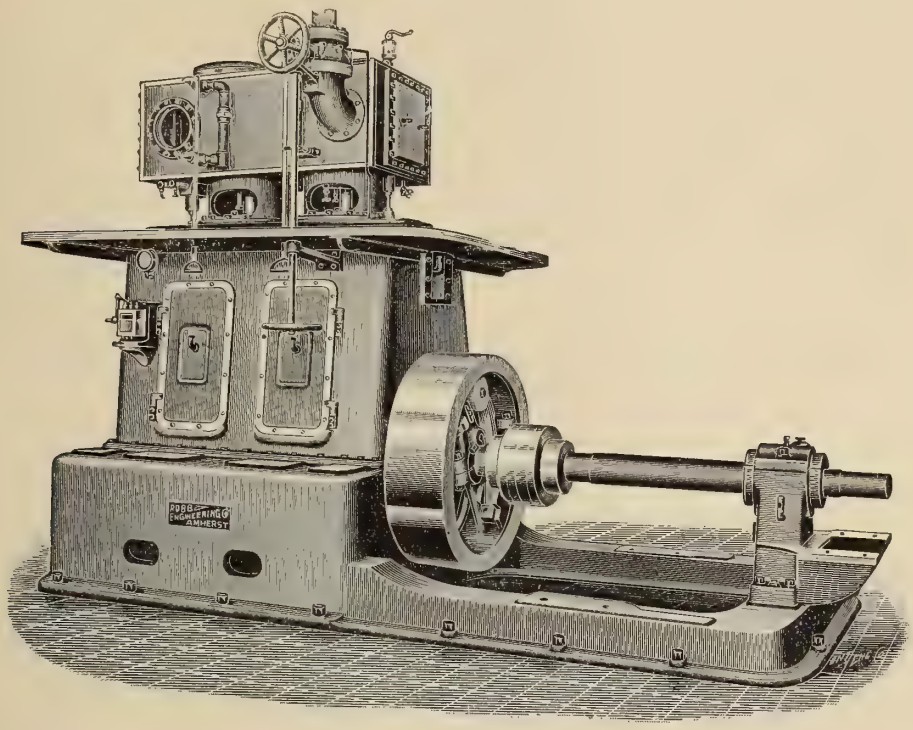
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A. T. LAING

Publisher's Announcement

THE delays and vicissitudes incidental to the inception of any new publication have temporarily modified the "Journal's" editorial and business plans.

It is, however, a part of our design to establish a page devoted to answering the enquiries of correspondents. We shall, moreover, be glad to identify minerals, to give information regarding mining matters, and to generally satisfy all pertinent enquirers.

We hope also to be able to announce, from time to time, the publication of articles of immediate technical value.

The "Journal," with its large and admirably placed circulation, is well adapted to serve the needs of those who are looking for help or employment. For these columns we shall make special rates.

We shall welcome suggestions and criticisms at all times.

No section of Canada in which mining is carried on will be overlooked in our effort to deal fully with our field.

The Business Manager intends to put an index to advertisements in a prominent place in ensuing issues.

A certain amount of space will be used in every number for the purpose of attracting attention to specific features of our advertising columns, and any change in our policy will be announced in this space.

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Particulars of Examinations and copies of the Calendar containing full information may be obtained on application to

THE REGISTRAR,
McGill University, Montreal

THE CANADIAN MINING JOURNAL

VOL. I, No. 1, New Series TORONTO and MONTREAL, MAR. 15, 1907 Old Series, Volume xxviii., No. 3

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

Devoted to Mining, Metallurgy, and Allied Industries in Canada

Main Offices - Confederation Life Building, Toronto, and 171 St. James Street, Montreal.
Branch Offices Halifax, Victoria, and London, Eng.

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Editors:

J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMBE
Sec. Canadian Mining Institute

Business Manager . . . J. J. HARPELL, B.A.
Asst. Bus. Manager . . D. B. GILLIES, B.A.
Circulation Manager . . . A. P. DONNELLY, B.A.

SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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ANNOUNCEMENT

The publishers beg to announce that *"The Canadian Mining Review,"* which has so long and so honorably identified itself with mining affairs in Canada, has been incorporated with *"Canadian Mining Journal."*

In taking this step the publishers were actuated by the conviction that it would be decidedly better for the whole mining fraternity to have one responsible national periodical.

The *"Review"* has in its lifetime done excellent work. It has helped to make history.

The *"Journal,"* it is hoped, will, with ampler opportunities, carry on the work in a larger field.

THE CANADIAN MINING JOURNAL

Its Opportunity, Aim and Purpose

At no time in the history of industrial development in Canada has the outlook appeared more favorable than at present. The country is enjoying in full measure a wave of prosperity, the effect of which is manifest in the phenomenal increase in trade activities, the extension of markets, the expansion of manufacturing interests, and the ready disposition of outside capital to seek investment in Canadian undertakings. This prosperity is general and widespread. It accurately describes conditions from seaboard to seaboard and is applicable with equal truth to all Canadian industries. In mining, however, in whose welfare we are concerned in particular, the recent advances and improvements have been gratifying to a degree, and all indications now promise an extraordinary revival of interest. In this belief the publishers have considered the occasion opportune to introduce to the public a new mining journal, national in range, of which the present is the first issue. It is thought that there is opportunity and wide scope for a periodical such as it is proposed *The Canadian Mining Journal* shall be, and the many expressions of encouragement and approval already received from men of eminence and position in the engineering and metallurgical professions, mine managers and others, have confirmed this view.

It is customary with the first appearance of a periodical for the publisher to make some pronouncement of aim and purpose. We conform to this convention: but we trust ere long to substitute achievement for promise. The aim, then, of this Journal is to supply a recognized demand. Without intending disrespect to our contemporaries, all excellent in their way, there does not exist at the present time a periodical ostensibly devoted to our mining and metallurgical industries which can lay true

claim to be really representative of those interests, or to comprehensively cover the wide field of Canadian endeavour in these directions. *The Canadian Mining Journal* starts its career under favorable auspices. It has no special interests to serve, no prejudices to obstruct its usefulness, and it is untrammeled by considerations of financial disability in providing the necessary machinery by which to accomplish its purpose. Hence, in the understanding that the first function of a newspaper is to publish news, arrangements have been completed to secure reliable information at first-hand by the engagement of a staff of resident and travelling correspondents, the majority of whom are technically trained men, in whose independence of view and general trustworthiness we have every confidence. A number of the most eminent specialists in Canada have also generously consented to lend their services in advisory capacities and will, moreover, act as special contributors to these pages. In this connection, it may be mentioned in passing, that *The Canadian Mining Journal* hopes to create a new departure in Canadian technical journalism in respect to the remuneration offered contributors to its columns. Heretofore too much advantage has been taken of the good nature of our leading scientists, who have been asked to write for Canadian papers on the ground that they would thus display a meritorious public spirit. But modern conditions of struggle and competition, "something for nothing," is anomalous. It is neither fair to ask nor just to expect such concessions; and *The Mining Journal* hopes to substan tiate its conviction that journalism in Canada can thrive without dependence on charity.

We have alluded to the recent revival of mining in Canada; but while this implies material progress of industry, the discovery of new and rich mineral territory and the extension of the productive area, we do not lose sight of the fact that this very improvement is resposible for "boom" conditions, which, as they are likely to react to the detriment of legitimate undertaking, are to be deplored. This exuberant state of affairs, however, is natural and inevitable; but it remains for the press—and in this respect *The Canadian Mining Journal* sees its duty very clearly—to unhesitatingly assume the task of safeguarding the public interests by fearlessly setting its face against "wild-catting," and the machinations and misrepresentations of the fraudulent company promoter. British Columbia in general, and Rossland in particular, have scarcely yet recovered from the ill-effects of the bursting of the "boom" bubble of eight years or so ago. The Cobalt "boom" promises to assume still greater dimensions. Althought the undoubted richness of the area warrants enthusiasm, it is safe to assume that a considerable proportion of the properties in which the public are being invited to invest—some of them in fact, described as Cobalt mines, are not even situated within the boundaries of the district, cannot pay to work, and their promoters have no false ideas on that score. This, and the speculative inflation of values, are clouds on the horizon; and it rests largely with the technical and financial press to avert the threatening storm.

In making itself an organic part of Canada's industrial life, *The Journal* will strive to follow intimately the rising generation of technical men. There are few who realize the valuable work which our technical colleges are doing, in supplying year after year highly-trained engineers, chemists and metallurgists. There are fewer who appreciate the tremendous importance of keeping these young men within our own borders, of training them to meet our own industrial problems. Thus and only thus may Canada fulfil her destiny.

With this brief introduction we bespeak for *The Canadian Mining Journal* favor and support. We shall hope to establish between our readers and ourselves sentiments of common regard.

If by our efforts and their co-operation we are able to assist in the upbuilding of a great Canadian industry, that, we feel, will be a privilege indeed, an incentive to work and effort in the widest sense and a high goal at which to aim.

EDITORIAL NOTES

An important change in the tariff, announced on the 11st inst., provides for a 99 per cent. drawback on bituminous coal, when imported by proprietors of smelting works and converted at the works into coke for the smelting of metals from ores. An ancient proverb tells us what the good dame remarked when she contributed her mite to the industrial resources of Scotland.

The necessarily superficial character of much of the geological and prospecting work done in Canada is now and then accentuated by the discovery of rich deposits in districts which have been explored and settled for many years.

The recently announced discovery of cassiterite in Lunenburg county, Nova Scotia, emphasizes the need and utility of constant and intelligent search for mineral deposits.

The field geologist is too hard-worked to indulge in detailed prospecting. But what he can do is to delimit the field for the prospector. Apparently this discovery of the valuable mineral cassiterite is due largely to the intelligent work of Mr. Faribault.

The demand for tin is constantly increasing. The supply is, on the other hand, practically stationary, and, as the reserves are diminishing, the metal is gradually rising in price.

In nearly all the tin-producing regions of the world cassiterite or tinstone, as it is commonly called, is the chief tin-bearing mineral.

Cassiterite is a black, brown or colorless mineral. In most instances the color is black or brownish. When black it shows a metallic lustre, when brown its lustre is resinous. Its streak, when rubbed on a rough unglazed porcelain surface, is never black, but varies from white to chocolate brown. It is hard, though very brittle and friable. Its brittleness easily gives a mistaken idea of

its hardness. It is heavy, and, therefore, easily separated by panning from most of the minerals usually associated with it.. In situations it occurs in sizes ranging from a graia up to individual pieces weighing one or two pounds.

Almost invariably cassiterite is found in veins cutting granitic rocks. Usually these veins are of quartz. The minerals topaz, fluorite, tourmaline, wolframite and arsenical pyrites (mispickel), are generally associated with the cassiterite. In these cases the cassiterite is of secondary origin.

But instances are known in New South Wales and the Dakota Black Hills where tinstone has been found in pegmatite as an original constituent of the rock. Presumably, the recently discovered tinstine in Nova Scotia falls under the latter category.

In a recent issue of *The Monetary Times,* some caustic remarks are made regarding certain alluring mining advertisements, which are to be seen in the daily press.

General and vague condemnation is, no doubt, valuable; but it fails of its purpose. A sure, though perhaps Utopian remedy, would consist in the concerted movement of the press against advertising any but *bona fide* mining companies.

It may devolve upon *The Canadian Mining Journal* to take specific action in the not remote future. Distasteful as this duty is, it must occasionally be done, if the best interests of the mining industry are to be conserved.

Meanwhile *The Journal* strongly recommends the excision of a few of the most efflorescent advertisements from the pages of otherwise responsible newspapers.

Knight-errant of a century that knows no romance, the prospector hits the lone trail for the tall uncut. Razorless, he perforce must grow a beard. Persecuted by the ubiquitous mosquito, suffering all the ills of exposure and privation, he eats his dough boys, smokes his twist and is content. Impelled by an urgent faith, he perseveres and fails and is forgotten, or, he finds and is famous.

Unsuccessful, he is spurned and flouted. Successful, he is fawned upon, flattered and not infrequently spoiled.

A badly regulated thirst is a not unusual concomitant of the first flush of achievement. For this the one specific is a return to the bush.

But, levity apart, his country owes to the fearless, tireless prospector a surprising debt of gratitude. Were it not for his perfervid enthusiasm, Canada would not now be reaping the rich harvest of Cobalt, not would she be taking her place among the great mineral producers of the world.

Laws are made with an eye single to the glory of greedy corporations; lobbies are vocal with the clamorings of special interests. The broker, the banker, the miner and the operator howl to the legislative moon when all things do not fit their fancies.

But the prospector, unprotected, uncaring mayhap, is silent. He cannot organize, he does not strike. He dies strange deaths in lone lands. Hymned by no bard, unsung of poets, the prospector is girding up his loins against another season of peril and flapjacks. We wish him God-speed! Prosperity be with him! Prosit!

The present agitation over the Ontario Government's proposed taxation of mines will supply much polemical pabalum to the press. From a controversial standpoint, the question is a somewhat torrid one.

The Journal wishes to encourage not controversy, but (so far as may be) dispassionate constructive criticism.

The conditions under which Ontario mining legislation has been framed must be kept in mind. No body of laws can be final. They must be a growth. Additions and amendments should be made only after mature consideration. A regulation which appears innocuous and even beneficial now, may develop a surprising sting in course of time. We have a body of mining men organized under the name of the "Canadian Mining Institute." These men are responsible citizens. Why should not the "Institute" be consulted in matters so vitally important to its members' welfare? We can think of no more capable, no more representative organization. It includes men who are versed in every phase of mining activity, and it embraces a wide diversity of interests.

We do not for a moment impugn the motive which inspire Ontario's legislators. It is probable that the objectionable features of the proposed bill have not been promptly enough nor strongly enough represented to the Government.

But even the eleventh hour is not too late. Let the Government step warily. It is making or marring for all time.

From the nature of his work the practical foundryman meets with difficulties which are surmountable only by the expenditure of much time and energy. One by one, he must encounter obstacles which to him are new, but which have, in modified forms, been met by many before him.

The key to some of these difficulties is held by the chemist, the solution of others is the property of foundrymen of riper experience.

Although there is a tendency to-day to call upon the chemist for incidental help, in relatively few cases is the function of applied chemistry recognized.

And, on the other hand, the experienced foundryman is apt to look upon his knowledge, knowledge gained in the rough school of xeperience, as his own peculiar property.

There are, in Canada, several active foundrymen's associations. These do much good. But, we believe, that an association organized upon a national scale, with active local sections, would inevitably improve the character of foundry practice.

Few establishments are large enough to justify the maintenance of a laboratory for their own work. But it is entirely practicable for a group of foundry owners to support an efficient chemist.

And the chemist in no sense supercedes the practical man. He merely provides a ready remedy for difficulties; he offers a short cut to efficiency.

Further, nothing can take the place of constant interchange of opinions and advice. The progressive man must be alive to this. A progressive industry must establish a community of interests among its workers.

A bill, entitled "An Act to Supplement the Revenues of the Crown," was given its first reading before the Ontario Legislature on February 13.

In the preamble it states that large sums of money have been and are being expended by the Province in administering mining affairs, encouraging mineral industries and opening up railways and other facilities to mining regions, therefore it is expedient to increase the revenues of the Province.

The bill accordingly provides that every mine in the Province, the annual profits of which exceed a certain

sum, shall be liable for an annual scaled tax, adjusted in proportion to such excess annual profits.

It further provides for the imposition of an acreage tax on all mineral locations and mining claims in any unorganized territory of the Province.

Clause 23 of the bill provides that in case any doubt arises as to the liability of any person to pay a tax under this Act, the Minister of Mines may compromise the matter by acceptance of such amount as he may deem proper.

Taken in its entirety, the bill is cumbersome. It is, moreover, inopportune. Undoubtedly it has been inspired by an honest and not unnatural desire to secure for the Province a larger share of Cobalt's riches. In attaining this end the framers of the bill have overlooked the inevitable effect that such an enactment would have upon mining interests generally.

That it would tend to divert foreign and domestic capital to other fields is undeniable. But its most immediate effect would be to depreciate the holdings of small investors.

In operation it would be singularly complicated.

Clause 23, referred to above, clothes the Minister with discretionary powers so absolute as to give him entire liberty to free any person or persons from payment of the tax. This is not only unsound, but unsafe.

Part II. of the bill deals with natural gas. It imposes a tax (amount yet unspecified) on every thousand feet flowing, drawn or pumped or produced by a well.

"A meter," it continues, "shall be affixed . . . to every pipe or duct at or near the mouth of every well," for the purpose of measuring and recording the total gross quantity of gas produced by the well.

It will be noticed that a distinction is made here. The tax on gas is on the gross quantity produced and not upon profits.

Incidentally it may be remarked that the affixing of meters to all pipes or ducts is either a physical impossibility or a matter implying a largely disproportionate expense.

It is, perhaps, pertinent to observe that in drafting legislation of this kind competent specialists should be consulted.

Could local interests and all questions of expediency be relegated to oblivion, we are confident that but few thinking men would dispute the necessity and adequacy of a properly adjusted acreage tax. The subject is a large and complicated one. Expediency must in most human affairs play a large part. But we are approaching a parting of the ways, when principles must be considered. Therefore it behooves us as citizens of a great country to squarely and fairly meet the questions of to-day and to settle them to the permanent good of that country and not to the temporary gain of party or persons.

The method, at present in vogue in Canada, of stimulating industry by subsidizing production is open to attack on sound economic grounds. We believe that the whole principle of the Government bonus on output is fundamentally unsound. In the case of the Canadian mineral oil industry we have, for example, an illustration of the inadequacy and disadvantages of the bounty as compared with the more straightforward and economically sounder protection duty.

Formerly Canadian oil was protected by a duty of $1.75 per barrel. At the solicitation of the American Trust, the Standard Oil Company, this duty was removed. In support of this step it was argued that Canadian production was not equal to the domestic demand. And the presumption was that the Canadian consumer would benefit by the free admittance of oil from the United States. Meanwhile, to compensate the operators of oil wells in Canada, the Government agreed to pay a bounty of fifty-two and a half cents per barrel on production.

As a consequence of all this the Canadian consumer pays exactly the same price for his oil as he did before.

The Canadian producer is getting $1.14 per barrel at the well in the Tillbury field, instead of $2.12, the average price per barrel in 1904, the year before the duty was removed. The American trust pockets the difference. Moreover, we are now supplied with American oil to the detriment of the new Canadian oil fields; which, together with the older sources, are quite capable of fully supplying the home market.

From other points of view the bounty system is open to objection.

One strong count against it is that it discourages the investment of capital in industries which, from the fact that they are subsidized by Government, are looked upon as unstable.

The very name "bounty" is unfortunate. Our mining industries require not the fortuitous and inadequate help of a bonus; but assistance of a very different nature.

A complete and well rounded system of education provides for the development of *all* the possibilities and powers which may be latent in us. It is incomplete and one-sided if it neglects or overlooks any of them. Judged from this standpoint, our educational facilities in Canada are far from complete. General education is fairly well provided for in our common schools, high schools and universities, but we have hardly done more than make a fair beginning in that kind which bears directly upon industries, viz., technical education. Now that we have entered upon a period of rapid growth, we should study carefully all the measures which may be taken to insure this growth shall be healthy, steady and permanent. We must work at our own problems in our own way. We may get good ideas by studying what has been done in other countries farther advanced in manufactures and other productive industries, but it would not be wise to transplant their systems to our soil. It is better to begin with existing institutions and develop them. We have here and there agricultural colleges, mining schools, dairy schools, and schools of engineering, but we have no technical schools devoted to textile, ceramic, metal-working, chemical, and other great industries. Technical education, pure and simple, is the function of such schools. In the modern world they are just as necessary to the effective development of the nation as are the common schools, the high schools, and the universities. All are necessary. We cannot afford to neglect or ignore any means of promoting clear thinking, keen research, and skilful production. We are becoming alive to this fact, and some of our societies, including the Canadian Manufacturers' Association, the Canadian Mining Institute, and the Society of Chemical Industry, have taken steps to bring the subject before the public and before the Legislatures. This is the right direction. We cannot afford to wait for the chance beneficence of individuals. There is one good idea we can import from Germany. There,

where universities, high schools and trade schools work together in their influence upon industries, they are sustained by the central Government, by the kingdoms, grand-duchies, etc., and by the municipalities. While the Act of Confederation leaves educational matters to the Canadian Provinces, there is nothing in it to prevent the Dominion Government from granting subsidies to provinces and municipalities for technical education. Such assistance will be necessary, as the revenues of the provinces are very limited, while that of the Dominion grows rapidly with the expansion of the country. Agriculture, mining, transportation and manufactures are national. This is recognized in the constitution of the Dominion Departments and their branches. Here is a chance for some of the Ministers to do a piece of work which will keep their memories as green as that of Colbert in France.

Our larger cities might make a beginning by converting one of their high schools into a technical or scientific high school. This would entail large expenditures, but boards of education which go forward courageously will soon see paying results in the gathering to such centres of the highest young intellects of the Dominion. The effects of such schools upon manufactures are soon felt. As the great German chemist, Ostwald, recently declared, the most valuable kind of energy in a country is mental energy, and the more brains we succeed in putting into our goods the greater is their value. The kind of education we are pleading for is that which will teach us to combine more mental energy with the rough primal material. In the last analysis, the greatest factor in a country's prosperity is the intelligence of its people. Not many years ago there was practically no foreign market for Canadian butter and cheese. Professor Robertson, Dr. Saunders, Dr. Mills and their colleagues showed the dairymen how to combine more mental energy with their products and now the markets of the world are open to us on favorable terms. The Masseys, Cossitts, Deerings, etc., have so combined mental energy with our iron and wood that Canadian agricultural implements are sold as far as the antipodes. But we have only made a beginning. Governments, Dominion and Provincial, municipalities, and men of wealth who love their country, must look into this subject in the light of the enormous extent to which scientific training is being utilized in modern industries. We are in the engineering age. The rule of thumb days are gone. We cannot afford any longer to be without such a system of technical education as shall touch every industry and be within the reach of every Canadian youth.

The Summary Report of the Geological Survey of Canada, which receives more extended notice in another column, breathes a spirit of progress and of judicially tempered aggressiveness.

The desirability of employing undergraduates of the Technical Colleges as summer assistants is strongly urged. It is also urged that their remuneration be ample enough to prove an inducement to the best men. This is not only right but necessary.

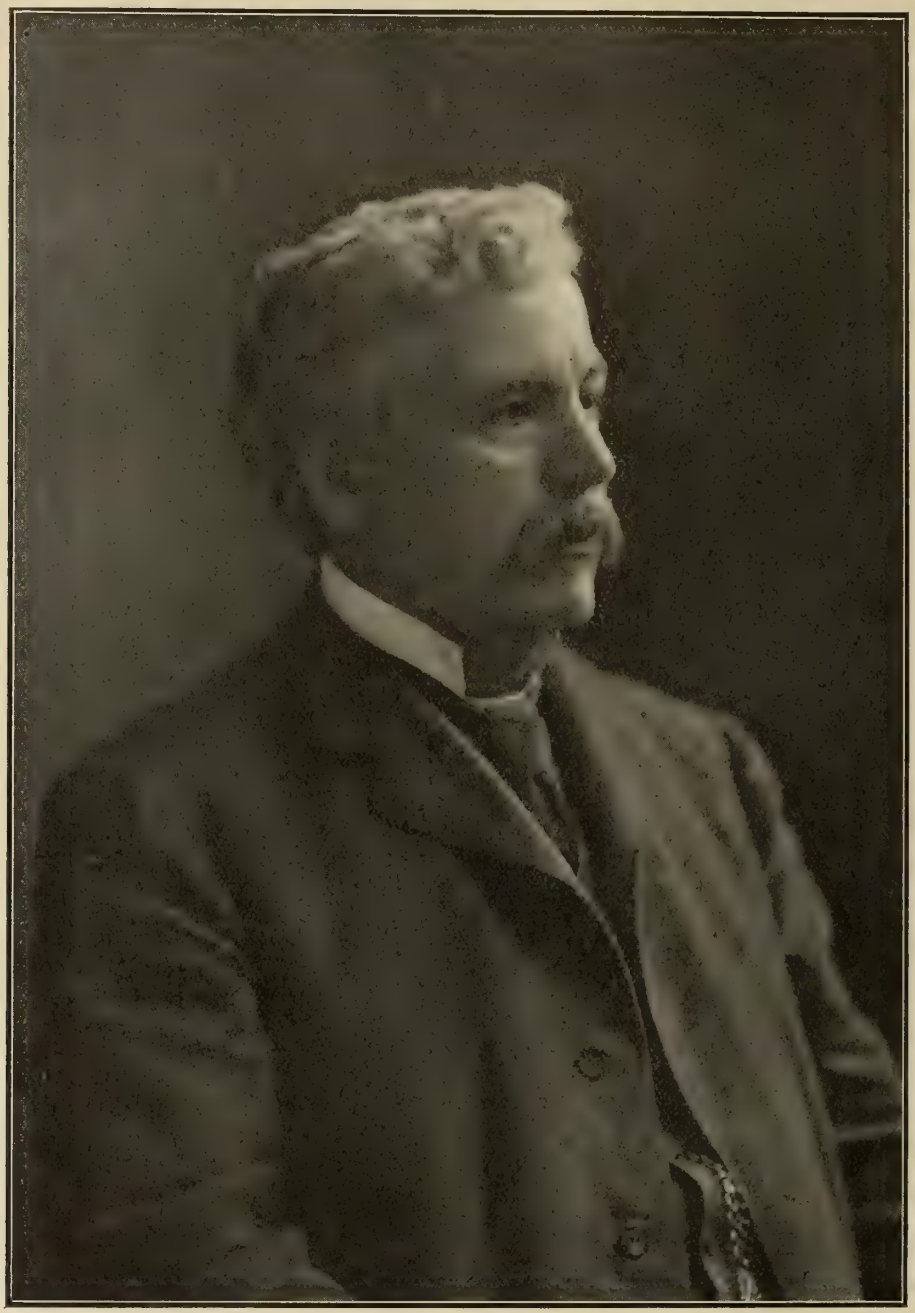
The Director also points out that the value of the mineral production of Canada has increased by leaps and bounds, until it now amounts to seven times what it was twenty years ago. No corresponding increase is to be observed in the appropriations of the Government for the work of the Geological Survey.

The annual meeting of the Canadian Mining Institute, which is to be held in Toronto on March 6th, 7th and 8th next, promises to be of exceptional importance and interest. A very large attendance is anticipated of men representative of Canadian mining and allied industries, while, too, we understand, the Institute will have the privilege of entertaining as its guests a number of eminent American scientists and engineers, including President Van Hise, of Madison University, Prof. Leith, Prof. Kemp, and Mr. John Hammond. The programme, which we publish elsewhere in this issue, includes a list of upwards of fifty papers, many of which are on subjects of special significance and interest at the present time. Thus, to mention a few, Prof. Van Hise's paper on the "Geology of the Cobalt Area; Mr. Hiram W. Hixon's contribution on the "Smelting of Cobalt Ores," being an expression of opinion from an undoubted authority on metallurgical matters—suggesting a solution of a difficult problem—and Prof. Leith's paper on the "Iron Ores of Canada," are extraordinarily opportune and of great practical value. The Institute is prosecuting a most useful work and it is satisfactory to learn that its scope and influence is steadily increasing.

In a recent issue of *The Mining Journal* (London), Mr. Edward Ashmead, F.C.A. contributes an interesting article on mining companies' registration in Great Britain during 1906. Compared with the remarkable record established in Ontario last year, in this respect, Mr. Ashmead's statement showing a registration of three hundred and eighty-six new mining issues, with an aggregate nominal capitalization of £29,829,435 fades into comparative insignificance. This, nevertheless, is a gain over registration returns for the corresponding periods of the preceding two years, due, in large measure, to a revival of interest in British metal mining. Foreign promotions were fairly evenly distributed, South Africa heading the list with fifty-seven companies, which, however, were for the greater part reconstructions or re-organizations of existing undertakings. Rhodesia, meanwhile, appears to be gaining in favour, and the gold returns from there last year were over 150,000 ounces greater than in 1905. Copper mines, however, have been in great request, and Mr. Ashmead states that good copper properties offered in any part of the world were readily taken up. In this list Canada makes a rather poor showing with but eleven registrations, three of which were Nova Scotian undertakings and two British Columbian. The Cobalt excitement has yet to extend to the old world, as apparently but one concern preparing to operate in this new territory was registered in London in 1906.

Dr. Robert Bell, F.R.S., Chief Geologist of the Canadian Geological Survey, has been awarded the Cullom medal for the year 1906. This is a timely recognition of Dr. Bell's long and honorable service.

We learn, with great regret, that Mr. A. P. Low, Director of the Geological Survey, is critically ill at his home in Ottawa. Although strong hopes are entertained for his recovery, it will nevertheless be several months before he will be able to resume his official duties.



THE HON. MR. TEMPLEMAN

The Hon. Mr. Templeman (who, upon the creation of a Federal Department of Mines, will be appointed Minister of this important Department), was born at Pakenham, Ont., of Scottish parents, in 1844. He has been engaged the greater part of his life in the business of publisher.

About forty years ago he established the *Almonte Gazette,* which is still in existence and enjoys a considerable circulation. In 1884 he removed to Victoria, B. C., where he established, in association with other gentlemen, the *Times,* one of the most important dailies of the Pacific coast. Mr. Templeman, who had already taken an active interest in politics, became a Senator in 1897, and entered Sir Wilfrid Laurier's Administration without portfolio in 1902. Early in 1906 he was made Minister of Inland Revenue, after resigning his seat in the Senate and being returned for Victoria by a large majority. During the summer of last year the Geological Survey, which had formerly been under the jurisdiction of the Department of the Interior, was placed under Mr. Templeman's charge. Our photograph is by Savanah, of Victoria.

INDUSTRIAL PIONEERS OF CANADA

John James Drummond, born in Ireland, 1856, family removed to Canada while he was still quite young. He was educated in Montreal. Having a strong bent for mechanics, he determined to make it his life-work, and, after a thorough training in some of the best Canadian shops, he removed to the United States in the early eighties, and gained there a wide experience in blast furnace practice. Returning, in 1889, he joined his brothers and other associates in the newly formed Canada Iron Furnace Company, Limited, and designed and built the present Radnor furnace, reorganized and systematized the manner of securing the bog and lake iron ores of the district, and modernized the methods then in vogue in respect to the supply of wood and manufacture of charcoal.

Under his personal superintendency the enterprise was most successful, the product of the Radnor furnace



JOHN JAMES DRUMMOND

proving of such high quality that the brand "C. I. F." became famous, not only in Canada, but in the United States, Great Britain, France, Belgium, Austria, and indeed in Russian, to all of which countries "C.I. F." iron was regularly exported until the Canadian trade became so large as to absorb the entire output of the furnace, which was necessarily restricted in point of tonnage on account of the natural difficulties in the way of securing each year more than a certain tonnage of the bog and lake ores of the district.

In 1899 the directors of the Canada Iron Furnace Company, Limited, determined to undertake the manufacture of foundry iron, with coke as a fuel. The port of Midland, Ont., was decided upon as a site for the new enterprise, and Mr. J. J. Drummond was entrusted with the establishment of same. He designed the entire plant, together with a system of docks that have no equal on the upper lakes. The whole work of construction was carried out under his personal direction, and by December, 1900, the first Midland furnace was blown in, the then Premier of Ontario, Hon. Mr. Geo. W. Ross, with a large number of leading Canadians, being present at the official opening.

The Radnor and Midland works were the first modern furnace plants ever designed and erected by a Canadian. Since then Mr. Drummond has rebuilt and reorganized the Londonderry works, and all three plants are still under his management, with a fourth furnace contemplated for erection at Midland or other point in Ontario.

Mr. Drummond possesses that rare combination of a sanguine temperament with tenacity of purpose. His clear vision of the larger national issues, his faculty of inspiring his subordinates with affection and loyalty, and his tremendous capacity for work have enabled him to surmount difficulties which would have easily discouraged a lesser man.

Men of his type are Canada's best product.

MINES AND MINING AT COBALT

By Willet G. Miller.

A year has now passed since the publication by the Bureau of Mines of the second edition of the writer's report on the "Cobalt-Nickel Arsenides and Silver Deposits of Temiskaming." I am now requested by the editor of *The Canadian Mining Journal* to prepare an article on this mining camp for the first number of *The Journal*. It is, however, difficult for me to add anything of scientific interest to what was contained in my report. I have there given as fully as was deemed desirable the history of the discovery of the camp, together with an account of the geology and of the veins and their contained ores. Although during the last year much work has been done in the camp, little has been added to our knowledge of the character and modes of occurrence of the ores and of the geology in general of the field.

An account of the stock-jobbing operations which have been connected with the camp during the past year would simply be a repetition of what has taken place in many fields during the last fifty years or more, illustrating man's cupidity, together with the absurd credulity and ignorance, which the many have in connection with mining matters. Cobalt has offered the best field for the stock-jobber in mines that the world has probably ever seen. It is within a comparatively easy distance of the great centres of population in Eastern North America. A Pullman car can be taken to within a few hundred yards of some of the richest mines, and the massive silver and other minerals to be seen in numerous veins are of the character to serve the purpose of the promoter. It is doubtful if the losses will not be greater through the prices at which the stock in some good properties has been sold than by what is invested in the real "wild cats." Over a year ago, by means of interviews in the press and in his report, the writer felt it his duty to warn the public concerning the period of stock-jobbing and mining on paper that he saw ahead. He felt, however, at the time that this would do little good. It seems that the public must have its period of gambling in mines every seven years or so, a period about like those in which occur epidemics that sweep off certain groups of wild animals in our northern regions. It is doubtful wether one should sympathize much with the ordinary purchaser of mining stocks. He does not buy stocks as

a permanent investment, but with the object of keeping it for a rise in price and selling it to some other fellow before the crash comes. He is then more inclined to buy stocks controlled by men whom he knows to be successful boomsters than to seek the advice of someone with a sound knowledge of the mineral industry. Such being the case the chief injury that the genuine mining man feels the industry suffers from a boom is that after its collapse it is difficult to raise capital for the development of good properties. There might be mentioned another element in connection with the Cobalt field which has assisted the boomster. This is owing to the fact that the geolical structure of the field is somewhat unique and difficult to understand by one who has not made a careful study of it. Hence the opinions of men whose reputations have been made in other camps are often of little value in connection with the ore bodies at Cobalt.

the older properties during the past year, and some promising veins have been found on the borders of the producing area, notably in the eastern part of Coleman township and to the northward.

Revised Map.

During the last half of the year a party under my direction has been engaged on the detailed mapping of the more productive part of the area. This map, which will be published during the coming spring, has been plotted to a horizontal scale of 400 feet to the inch, and with ten feet contours. It covers an area about fourteen square miles in extent. In an east and west direction it extends approximately from Clear Lake to the western boundary of the township of Lorrain. Its northern boundary is the southern edge of the township of Bucke, while to the south it is bounded by a line running east



GILLIES LIMIT EXPLORATION. GOVERNMENT CAMP, DIABASE POINT, GIROUX LAKE

Characteristics of the Veins.

The most striking feature of the camp is the occurrence of numerous narrow veins, probably averaging less than four inches in width, and the great richness of these veins, unique in their mineral contents, in so far as is known in North America, in that they carry high percentages of cobalt, nickel and arsenic, associated with silver in the native state and in lesser amounts in compounds. The number of workable veins so far discovered is difficult to estimate, but it can be put at approximately one hundred. Others will be found, especially on the older producing properties. The method of prospecting for these veins is somewhat unique, consisting of digging trenches in a more or less systematic way through the soil where the rock is not exposed. The surface of the bed rock being uneven, thethickness of the soil varies greatly, and the depth of the trenches is from a few inches to fifteen feet or more. Many miles of trenches have been dug in the district, and within certain areas the work can be carried on with the certainty of discovering veins before a large part of a mining location has been examined.

A considerable number of veins has been discovered on

and west through the northern part of the Gillies timber limit. The productive veins, or those likely to be productive known at the time our work was done, are plotted to scale. While this map gives, of course, a more accurate knowledge of the boundaries of the exposure of the various series of rocks—Keewatin, Huronian and diabase—our work on it has not changed our views concerning the origin and relationship of the members of the series.

The map, which was published from our work in 1904, of which 16,000 copies have been used by those interested in the field, has served its purpose. When the field work on it was begun in 1904, the area which is now the township of Coleman was literally a *terra incognita* so far as maps were concerned. We had not only to map the lakes and streams and to show as far as practicable the distribution of the rocks, but we had also to determine the relationship of the rocks as well. In addition to this we had, of course, to study and describe the rare and unique group of minerals, so far as North America is concerned, found in the veins. Comparatively little prospecting was done in 1904, and the map was ready for the first prospectors who entered the field in 1905. If we had had either more funds at our disposal or more time for the

work we could have prepared a more perfect map, but our desire was to have the map ready for the prospector, instead of waiting and publishing what may be called a *post-mortem* sheet, such as has been the case in most mining fields. Owing to the removal of the trees over much of the area and to the fact that much work has been done in the way of stripping the surface, we are now able to determine the boundaries of the various formations with greater accuracy.

Structure of the Area.

Although the geology of the area is probably known to most of our readers, it may be well to summarize it for the purpose of this article. The oldest series of rocks in the district of which we have any knowledge is what is called the Keewatin. This essentially a complex igneous, volcanic, series, consisting essentially of greenstone and other basic rocks, associated with which in minor amount sare granite, porphyry and acidic types. The Keewatin is called a complex series. because it is made up of rocks which not only differ in their chemical and physical characteristics, but which also represent different periods of eruption, these eruptions having probably taken place throughout a great interval of time. The term Keewatin is simply an age name, which is applied to this interval of time.

At the close of the Keewatin age, and after the igneous rocks belonging to it had been disturbed and altered, there took place a great intrusion of granite, which cut through the Keewatin series. To this granite, which is extensively developed in the township of Lorrain, the name Laurentian, another age name, is given.

After the eruption of the granite the surface of the earth in this part of the continent was subjected to a prolonged period of erosion or wearing down action. Valleys in some parts of the area were cut deep into the surface, producing a landscape more rugged than that of the present day. Then there was a gradual subsidence beneath the waters, and the valleys became filled with gravel, sands and clays, more or less impure. which finally formed a mantle deep enough probably to cover the hill tops.

This period of subsidence, during which gravel and other fragmental material were deposited, is known as the Huronian. It undoubtedly representes a great length of time.

As stated in the writer's report, some of the coarser bouldery material in the Huronian has the appearance of a glacial deposit, giving the impression that glaciers may have been active for a time during the far distant Huronian period. There are some points in connection with these coarse fragmental series which are, however, difficult to reconcile with a glacial origin of the material. We know, for instance, that some, at least, of this material has originated in place and represents the weathered surface of the Keewatin and Laurentian on which it is deposited. Moreover, there is no unconformity, in so far as the writer knows, between the underlying slaty graywake and feldspathic quartzite series and the overlying conglomerate, such as would occur if the conglomerate were of glacial origin. Striations on boulders in the conglomerate may be produced either by the slight movements which can be seen to have taken place in the rocks or probably by the change in volume of the bolders through the serpentinzation of chloritization of their surfaces.



GILLIES LIMIT. GOVERNMENT GEOLOGICAL PARTY

The term agglomorate, meaning fragmental material ejected from a volcano, is a misnomer when applied to these Huronian conglomerates.

After the deposition of the Huronian boulders, gravel and sand, and after these had become hardened to conglomerate, greywake slates and impure quartzites respectively, another eruption of igneous material took place which invaded all the older series—Keewatin, Laurentian and Huronian. Much of this diabase spread horizontally through the other series, from east to west, across about the eastern half of what is now the more important part of the productive mineral area. In some parts of this area, which has been worn down several hundred feet or more since the diabase eruption, masses of Keewatin are in places found overlying the diabase. Along the western face of the main mass of the diabase shown on our map, east of Peterson Lake, the Huronian series can be seen to dip gently under the diabase. On

its western edge the diabase is now only a foot or so in thickness at some points. At Diabase Mount and at the Devil's Rock it can be seen to be at least 300 or 400 feet thick. Originally the diabase probably had a mushroom-like form, spreading out horizontally between the older rocks, which have now to a large extent been worn away from above.

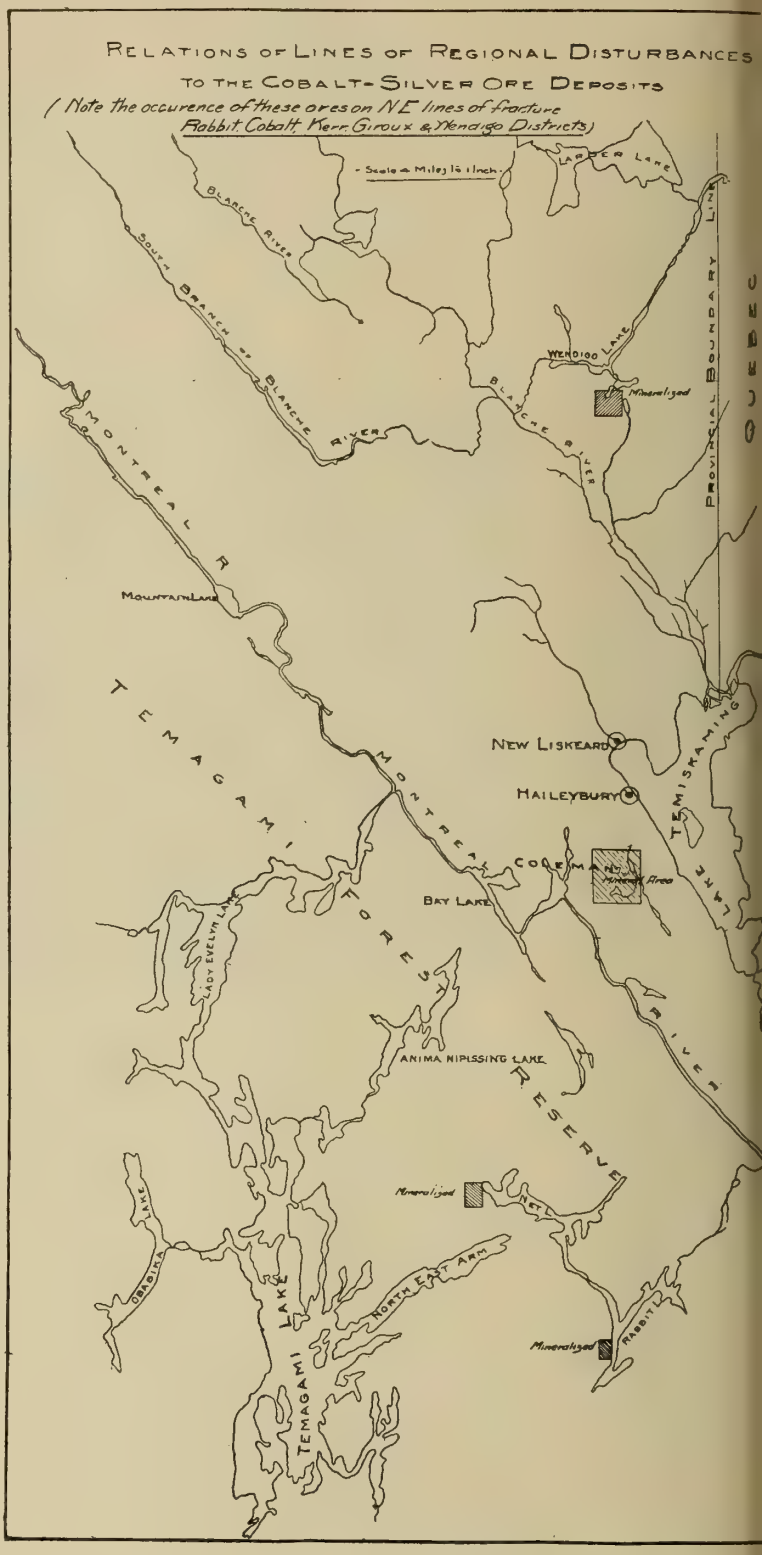
Formation of Veins.

The veins, which are being worked chiefly for their silver content, but which also carry values in cobalt, nickel and arsenic, appear to have been formed at the period when the cooling of the diabase was taking place. On cooling the diabase would contract, producing fissures, not only in its own mass, but also in the rocks with which it was in contact or which lay adjacent to it. Some fissures may, of course, have been formed at the time of the eruption of the diabase, but there is nothing to prove that any of those of economic importance were produced by this disturbance. At points where it is possible to make observations, it is found that the metal-bearing veins pass downwards from rocks intruded by the diabase into the diabase itself. This shows that the fissures in the diabase are contemporaneous with those of the surrounding rocks.

The Huronian rocks, being more readily fractured than either the diabase or the Keewatin, it is natural that the greater number of the veins are found in them. Many of the veins in the Huronian occupy openings which have the appearance of being ordinary joint cracks, as if these rocks during gradual settling of the area after the diabase eruption had be affected by jointing. The Keewatin, on the other hand, at a distance from the diabase, has not as yet proved to contain veins of economic importance, and some veins carrying good values in the Huronian have been found to be practically barren, especially of silver, when the underlying Keewatin is reached. In the eastern part of the more productive area, where the Keewatin comes in contact with the diabase, and where masses of it rest on the diabase, a few good veins have been found on it. The Keewatin, under these conditions, while being very tough as compared with the easily jointing Huronian, could not fail to be fissured, floating as it does at times on the diabase.

Origin of the Ores.

It seems pretty clear that the ores of silver, nickel, cobalt and arsenic were deposited from solution in the heated, impure water which followed the diabase eruption, representing the end product of the volcanic action. As to the source of the various metals, *i.e.*, as to whether they were carried up from great depths by the heated waters, or whether they were wholly or partly leached from the rocks through which the waters passed, it is impossible to give a definite answer. The metallic silver now contained in the veins existed originally, in all probability, in the compound form. The cobalt-nickel ores were deposited in the cracks and fissures at an earlier period than the silver. Some fissures were completely filled with the cobalt-nickel ores and their associated gangue material, chiefly calcite, at this early period. Afterwards there was a slight movement probably due to the gradual settling or contraction of the area owing to the continued cooling of the diabase or from some other cause. This slight movement disturbed many of the veins already filled, producing cracks and openings in them, through which percolated the silver-bearing solutions. Some of the cobalt-nickel veins, however, even in the Huronian, escaped this disturbance. Hence we find that they do not contain silver in economic quantities. The question has been asked, why, if a vein



passes from the Huronian into the underlying Keewatin, it should, if it carries silver in the former formation, not contain it in the latter. The answer to this seems to be that, while the disturbance after the deposition of the cobalt-nickel ores was sufficient to affect the Huron-

ian rocks, it was not, in many cases, of great enough magnitude to disturb the veins in the tougher and more massive underlying Keewatin. It may be added that while some strong veins in the Huronian continue into the Keewatin, others end abruptly when the Keewatin is reached. At times strong veins in the Huronian are succeeded in the Keewatin by several branching cracks and fissures.

Extent of Territory.

While the area in which the veins rich in silver are found is only about six square miles in extent in the township of Coleman, with two or three locations in the township of Bucke, the area over which ores of Cobalt have been found is much larger. Cobalt ores have been shown to occur at various points about 30 miles north of Cobalt station, and they have been found in small quantities about the same distance to the southward. To the westward these ores have been found in the western part of Coleman, near Portage Bay, and also in the Temagami Forest Reserve, 25 or 30 miles from Cobalt. In the writer's report attention was drawn to the striking regularity of the great water courses of the district, especially those running from northwest to southeast. It was also shown that there is a less striking system of lakes and streams which follow northeast-southwest lines. These lines probably represent faults or folds, and can be called in a general way lines of weakness. The accompanying diagrame shows the relationship of some of the more important of these lines. The occurrence of the cobalt ores seems to be connected with the northeast-southwest lines. It will be noticed that the Cobalt area proper is on one of them. Then the discoveries of cobalt which have been made near Wendigo Lake are along another line, consisting of a chain of eleven small lakes. In the vicinity of Rabbit Lake, to the southward, where a little cobalt has been found, we have another similar line.

Production.

The following table shows the production of the camp in 1905. Statistics for 1906 are not yet complete, but it can be said that the output of silver was worth approximately $3,500,000. Much of this ore was taken from the cuts and from shafts and drifts during the progress of the development work. Little stoping has been done on some of the most important properties.

	Quantity.	Value.
Tons of ore shipped	2,144	.....
Silver, ounces	2,441,421	$1,355,306
Cobalt, tons	118	100,000
Nickel, tons	75	10,525
Arsenic, tons	549	2,693

The silver contents of the ore in 1905 averaged 1,138.72 ounces per ton of ore.

Refining.

Up to the present time there has been a loss of nearly 25 per cent. of the value of the average grade of ore shipped, owing to the lack of proper refining methods. During last year practically nothing was received for the cobalt, nickel and arsenic contents of the ore, although the percentages of the substances average about 6, 3 and 30 respectively.

Some of the ore has been partially treated at Sudbury, but the greater part of it has been shipped to the vicinity of New York.

Plants for the treatment of the ores are now in course of erection at North Bay and Sturgeon Falls, and associations of the mine owners are arranging for the treatment of the ores at Deloro, in Hastings county, and in the Niagara peninsula.

Revenue From the District.

While many individuals have made fortunes in the district, eight or ten Canadians having become millionaires, the revenue derived by the Government has also been important. The mining rights to Cobalt Lake were sold by tender for $1,085,000, and those of Kerr Lake for $186,500. In addition to this, 25 per cent. of the gross value of the ore at the pit's mouth is received from one mine, and the Railway Commission. representing the Government. receive svarying percentages on the railway right of way, and on the town site of Cobalt The development of the district has been of great benefit to the Government railway, the Temiskaming & Northern, and to the agricultural district to the north.

At the last session of the Legislature an appropriation was voted for the exploration of the Gillies timber limit, the mineral rights of which had been retained by the Crown. During the past few months a party, under the writer's direction, has been engaged in preparing a geological map of the northern part of the limit, and in searching for veins, several of which have been discovered. The most important of these was discovered on July 19th while trenching through a thickness of four or five feet of soil. A shaft was then sunk in the rock outside of the vein to a depth of 75 feet. A cross-cut was made to the vein, and at the present time a drife has been made along the vein for a distance of 150 feet, showing ore of a high grade. This vein having been developed directly by the Government, represents a unique mine in North America, the first and only one worked directly, it is believed, by a Government.

ONTARIO MINING LEGISLATION

Owing to the recent discovery of minerals in the Cobalt district and the great development of that part of the Province, the Government of Ontario introduced, at its last session, an Act relating to mines and minerals, known as "The Mines Act, 1906." This Act supercedes the former Mines Act, and prospectors should have knowledge of those parts of the Act which direct the manner in which title may be acquired to mining properties.

It would be impossible in an article such as this to discuss the Act in detail, but the writer will endeavor, in as small space as possible, to give some information to intending prospectors and others interested in mining who have not hitherto become familiar with the requirements of the law.

The first thing a prospector must do if he intends to discover and explore mining properties, is to take out what is known as a miner's license. This license can be procured from the Minister, Deputy Minister, or any mining recorder by any person over the age of eighteen years upon payment of a certain fee. The fee for a license for an individual is $10, unless the license is procured on or after the 1st September, 1906, and prior to the 1st April, 1907, when the fee is $5. The fee for a license for a partnership or incorporated company varies according to the number of members of the partnership, and the authorized capital of the company. All licenses

expire at midnight of the 31st day of March after their issue, but are renewable. As noticed above, any person over eighteen years of age may procure a license. It is also provided that, although a licensee may be under the age of twenty-one years (which, generally speaking, is the age at which persons can by contract create legal liability) he shall, as regards his mining property and liabilities contracted in connection therewith, be deemed to be of full age.

When a person has procured his license he is in a position to prospect for minerals, either on his own behalf or on behalf of any other license on Crown lands and on lands, the ores and minerals whereof have been reserved by the Crown, except lands which are staked out and occupied as a mining claim or are under working permit, or are withdrawn from exploration by any Act or order-in-Council. (Prospectors in the Forest Reserves must have an additional permit to be allowed in such reserve.) If he makes a discovery of valuable mineral he must then "stake out" his claim. A mining claim and area comprised in a working permit in unsurveyed territory must be laid out with boundary lines running north and south and east and west, and must not exceed a square of twenty chains containing forty acres; but an irregular portion of land lying between two or more claims may be staked out with boundaries coterminous with the boundaries of adjoining claims, provided such irregular claim does not exceed forty acres. In townships which have been surveyed into sections of 640 acres or 320 acres, a mining claim must not exceed forty acres, and in townships which have been surveyed into sections of 200 and 100 acres, a mining claim must not exceed fifty acres. In order to "stake out" a mining claim the licensee must plant a discovery post of wood or iron upon an outcropping or showing of mineral; upon this post must appear the name of the licensee making the discovery. If the discovery is made on behalf of a licensee other than the discoverer, the name of such other licensee and the number of his license must also appear on the post. A post must then be planted at each of the four corners of the claim in the following order: Post No. 1 at the northeast corner, No. 2 at the southeast corner, No. 3 at the southwest corner, and No. 4 at the northwest corner. The number in each case to be on the side of the post which follows it. The particulars required to appear on the discovery post must also appear on No. 1 post, and if the claim is in a township surveyed into lots the sub-division or part of the lot intended to be comprised in the claim must also appear. If there are standing trees upon a mining claim the licensee must blaze the trees on two sides only, and cut the underbrush along the boundary line of the claim, and also blaze a line from No. 1 post to discovery post and mark on No. 1 post the distance to the discovery post If there are no standing trees he shall indicate the outlines of a claim and also a line from No. 1 post to discovery post by planting pickets, not less than five feet in height, at intervals of not more than two chains, or by erecting at the same intervals monuments of earth and rock not less than two feet in diameter at the base and at least two feet high. No more than three claims may be staked out and recorded by a licensee in any mining division during the period covered by a license year.

When the licensee has staked out his mining claim he must, within fifteen days thereafter (except where the claim is more than ten miles from the office of the recorder, when an additional day is allowed for each additional 10 miles), furnish to the mining recorder a plan of the claim showing the posts and the distances from each other in feet, together with an application giving the name of the licensee interested and the number of his license, the name (if any) of the claim, and its locality, as indicated by some general description, so that the recorder can lay down the claim on his office maps. If the claim is in a surveyed township the portion of the lot intended to be comprised in the claim must also be given. If the outlines of the claim are not regular the length of such outlines shall be given, and also the cause of their not being regular, and the situation of the discovery post by distance and direction from No. 1 post. The application must also state the time of the discovery, when the claim was staked, and the date of the application. Both the plan and application must be verified by oath. In addition to the foregoing requirements, the discovering licensee must make an affidavit showing the discovery of valuable mineral and that "the deponent has no knowledge and has never heard of any adverse claim by reason of prior discovery or otherwise." The affidavit must also state the locality of the claim, as indicated by some general description or statement. This affidavit has caused considerable difficulty. Suppose the licensee applying has heard of a prior claim which he knows to be invalid, can he say that he has never heard of any adverse claim? It seems clear that he cannot truthfully do so. If this is so, is it sufficient for him to swear that he never heard of any adverse claim except (mentioning the claim of which he has heard)? Is the recorder bound to accept an affidavit in this form? Such an affidavit was presented to the recorder, who refused to file the application. The matter then came before Mr. Justice Anglin, who held that the affidavit might contain exceptions, and ordered the recorder to accept the affidavit and file the application. This decision has been appealed from to a Divisional Court, but the appeal has not, at the date of writing, been argued.

A point to be remembered is that if the mining claim is filed against land, the surface rights of which are owned by a settler, the applicant cannot get a certificate of record until he has settled with such surface owner as to compensation for damages to the surface. If he and the owner are unable to agree, the Mining Commissioner has power to settle the amount. After this is done, and after sixty days have elapsed from recording of the claim, if no dispute as to the right of the applicant has been recorded, and if the claim is passed by the inspector, the applicant may procure a certificate of record of his mining claim. When the certificate of record is granted, it shall, in the absence of fraud on the part of the licensee, be final and conclusive evidence of the performance of all requirements of the Act, except working conditions, and in the absence of fraud the claim shall not be subject to forfeiture, except for non-compliance with working conditions.

After a licensee has procured his certificate of record he must do certain work upon his claim During the three months succeeding the recording of the claim he must carry on mining operations to the extent of not less than eight hours per day for thirty days. During each of the two years following the expiration of the three months he must do similar work to the extent of not less than eight hours per day for sixty days; and during the third year he must do similar work to the extent of not less than eight hours per day for ninety days. This work may be performed in a less period if the licensee desires. The licensee must make a report, verified by oath, to the mining recorder, showing that the working conditions have been complied with. He

may then get a certificate from the recorder to that effect, and if he applies within three months from the expiration of three years and three months from the recording of the claim, then upon payment of the purchase price he is entitled to his patent, which gives him a title to the property which is not subject to forfeiture. Special provisions are in the Act, allowing the work to be done on one of several adjacent claims owned by one person.

If a licensee desires to obtain exclusive possession of an area of mining lands, not exceeding forty acres in extent, open for exploration with a view to discovering minerals, he may procure what is known as a working permit upon complying with certain conditions. He must first stake out the boundaries by planting a post at each of the four corners. These posts are to follow in the same order as in the case of a mining claim. If one or more of the corners of the claim fall where the nature of the ground renders the planting of posts impracticable, as, for example, if one of the corners is under water, such corner or corners may be indicated by planting at the nearest suitable point a "witness post," which shall contain the same marks as corner posts, together with the letters "W. P." and an indication of the bearing and distance of the site of the true corner from such witness post. The licensee shall write on No. 1 his name, and, if he is staking on behalf of some other licensee, he must also give the name of such other licensee and the number of the license of such licensee and the date of the planting of the posts. He must then, if there are standing trees, blaze the trees upon two sides, and cut the underbrush along the area where there are standing trees. The outlines of the area may be marked in the same manner as in the case of a mining claim, except that pickets or monuments of earth or rock may be at intervals of four chains instead of two, as required in the case of a mining claim. The licensee must write upon No. 1 post "working permit applied for," and must make three rings or notches, not less than a quarter of an inch deep and not less than two inches apart, beginning at a distance of not less than two nor more than three inches from the top. The licensee shall also make a trench not less than six inches deep for a distance of not less than six feet, beginning at No. 1 and running along the boundary line between No. 1 and No. 2, and also a trench of the same depth and length along the boundary between No 1 and No. 4. If the area is in a surveyed territory the licensee must indicate on No. 1 post the portion of the lot upon which the area is situated. The area must not exceed forty acres in a mining division, or twenty acres in a special mining division. The applicant must then furnish to the recorder an application in duplicate, indicating the location of the area by reference to some ascertained boundary or locality, and he must furnish to the recorder within fifteen days proof of the planting of the posts and their distances from each other, together with an application in writing with proof under oath of the name of the licensee interested and the number of his license; such general description as will enable the recorder to lay down the area on his office maps, the time when the posts were planted and the area staked out, and evidences on oath "that the land at the time of its being staked out was not in occupation or possession of or being prospected by any other licensee, and that the deponent has no knowledge and never heard of any adverse claim by reason of prior discovery or otherwise"

It will be noticed that this affidavit is very similar to the one required to be made when applying for a mining claim, and the question has arisen, may the affidavit state that the deponent has never heard of any adverse claim except (mentioning a claim which he thinks not to be a *bona fide* claim)? The Mining Commissioner has held that there can be no exception mentioned in this affidavit, and that if the applicant cannot make the affidavit without any exception he cannot get a working permit. This decision, however, has been appealed against, and is now awaiting the judgment of the Divisional Court.

After the licensee has filed his application he must procure from the recorder a certificate of his application and affix it within three days after it is granted to No. 1 post, unless the area is more than 10 miles from the recorder's office, when an additional day is allowed for each 10 miles. After sixty days, and within seventy days from the staking out of the area, the licensee must apply for a working permit from the mining recorder. A working permit will not be granted where the surface rights have been sold until the licensee has arranged compensation with the owner, in the same manner as an applicant for a mining claim. An application for a working permit gives no right to exclusive possession until the permit has been granted. The licensee, after procuring his working permit, must search for minerals to the extent of not less than eight hours per day for five days in each week, during the six months next following two weeks from the issuance of the permit. Once it is granted the holder of a working permit has a title such as the practical miner wants, absolute possession, so long as he works the property, convertible into a patent as soon as his work results in a discovery which will pass inspection. If that cannot be obtained in three years the miner is as well off without a patent. The Act provides that all discoveries are subject to inspection by the inspector, but the writer will not deal with this branch of the Act at the present time. All papers prior to patents are filed in the offices of the recorders of the respective divisions and many details must be observed, as to most of which the recorder can furnish information. Once the application for patent is made, the papers go to Toronto, the land fees are paid there, and the patent when issued carries the land under the Land Tables Act, and it is governed by the ordinary land laws, save that to carry on the business of mining, by person or corporation, the annual license must still be taken out.

THE UNDEVELOPED MINERAL RESOURCES OF CANADA

At a recent meeting of the McGill Mining Society, Dr. Frank D. Adams, Logan Professor of Geogogy at this University, delivered an interesting address on the subject of the undeveloped mineral resources of the Dominion. The speaker, in his introductory remarks, stated that the public generally failed to grasp the relative importance to Canada of the mineral industry. In the last twenty years the mineral output had increased from a valuation of the million dollars per annum to approximately seventy million dollars, and in view of enormous mineralized territory as yet unworked, it might not be too much to expect that Canada in due course would become the greatest mineral producing area of the world. "Now," the lecturer proceeded, "it becomes a matter of interest to inquire whether this output, which has increased so extremely in the past twenty years, will continue to do so. If we may depend on geological science, the reply is in the affrmative. From

the Researches of the Geological Survey we now know, aproximately, the extent of our mineralized areas and the localities in which minerals will probably be discovered."

Referring first to coal, the lecturer pointed out that coal occurred in this country both in the carboniferous and cretaceous formations, the coal fields of the Maritime Provinces occuring in the former, while those west of the Rocky Mountains belonged to the cretaceous period.

Although the area of trap rock in Nova Scotia is comparatively small when compared with New Brunswick, teh coal seams here are much thicker and constitute the most important of the Eastern coal areas.

While no recent estimate has been made of the probable extent of this field, the Sydney field alone was known to contain at least one thousand million tons of coal, and this represented a very small section of the undeveloped coal resources of Cape Breton.

In New Brunswick there is a great distribution of the carboniferous system, but the coal fields are thin; in most cases only twenty to fifty feet below the surface. It is, nevertheless, estimated that thi sarea contains about one hundred and fifty millions of tons of coal at present undeveloped.

Again, all along the southern side of the Baie of Chaleurs are undeveloped coal fields, dipping into the sea and flooring the whole Baie, and these areas will doubtless in time be worked.

The most easterly development of coal in the western system is in the Souris River district, in Manitoba, where lignitic coals are mined. The quality of the product improves as one proceeds westward, and good anthracite is found in the Rocky Mountains. Dr. George Dawson has estimated that in the district of Lethbridge there are about five and a half million tons of coal under each square mile; in the district of Blackfoot about nine million tons under each square mile; and at Medicine Hat about four million tons under each square mile. Hence, in this section of the country we have coal in great quantities, near the surface and easily worked.

Again, in the great Crow's Nest Pass coal area, according to an estimate made by Mr. James McEvoy, there are in the vicinity of twenty-two thousand five hundred and ninety-five million tons of available coal. Further north, near Banff, are extensive fields of anthracite; while beyond are the coal area sof the Peace River and of the districts between Clearwater and Red Deer River, where recently was found twenty-four seams with an aggregate of ninety-five feet of workable coal, as well as other discoveries of value. Along the proposed route of the Grand Trunk Pacific coal fields have been discovered, and when this line is completed it should result in the development of new and important areas.

The gold production of Canada has recently shown a decrease, largely on account of the exhaustion of the rich Klondike placers. But gold is found in nearly all the Provinces of the Dominion. Nova Scotia for many years has produced largely, but while the quartz is rich, the veins are narrow and somewhat expensive to work.

There are also indications of possible gold discoveries in New Brunswick. In the Eastern Townships alluvial gold has been found in the Chaudiere valley, but the section has not as yet proved regularly productive. Then on all the streams running into the St. Lawrence to the north, in the Laurentian country, gold exists, though heretofore it has not been found in payable quantities. A gold property on the Riviere du Loup en Nant, however, was worked for about a year, and yielded sufficiently well to pay expenses. So that in this area we have a gold field which at some future time may possibly be worked to advantage.

Again, there are the gold fields in the Hastings district of Ontario. The gold here is associated with a great intrusion of granite, where we often find mineral deposits. The veins here are rich, though pocketty. In the Rainy River country some forty or fifty mines were operated at one time.

Crossing the plains fine gold is found in the lands of the Saskatchewan river; and with adequate equipment these lands might be made to yield a considerable amount of gold. In British Columbia we have great gold fields; and, too, in the Yukon. In the Klondike section the cream of the gold fields has been skimmed, but all through this country there are great auriferous deposits, which with the aid of capital should prove very profitable to work. Quite recently, however, valuable deposits have been found by a member of the Geological Survey. In the Lake Bennett district quartz reefs have been discovered from two to fourteen inches wide and traceable for long distances. These veins contain not only native gold, but gold in association with tellurium, and have already yielded results up to five thousand dollars per ton. Hence we are gradually extending our mineral producing areas.

In British Columbia, which is after all but a continuation of the California mountain system, there is every reason to anticipate the discovery of new rich alluvial deposits; and the geological conditions are such that we may expect that country, when fully explored, to prove a second California in point of mineral richness.

Canada, as is well known, is the greatest nickel producing country in the world. In 1905 the Sudbury mines produced upwards of seven and a half million dollars worth of nickel. These valuable deposits occur in the Huronian, the great mineral-bearing rocks of North America. The mines were first worked for copper, but the ore proving very refactory to smelt led to the discovery that it contained nearly as large a percentage of nickel.

In addition to the properties now being worked, there are a number of mines in the district which have been partially developed, but from which production is not being made, the operative properties supplying fully the present market demands. Then nickel has also been found to the south, outside this area, and still other discoveries will undoubtedly be made, as we have the same geological conditions in different localities. These nickel deposits are sufficiently extensive to supply the world's requirements in this metal for many generations, and the industry, as we have seen, is capable of great expansion.

Passing next to copper, we find from statistics that Canada produced last year over seven and a half million dollars in this metal. What was remarked of nickel in Ontario applies equally to copper, and all through the Huronian belt we find valuable deposits of copper and nickel. In the Temagami district rich discoveries have also been made, and throughout the area the indications are most promising. British Columbia, however, is the great copper producing Province of the Dominion. To this output Rossland is a considerable contributor, though its record is eclipsed by the Boundary District, where are found enormous deposits of low grade ores, which can not become exhausted for many years to come. Farther west, the Geological Survey has reported the

occurrence of considerable deposits of copper, which should prove very valuable when developed; while on Texada Island and the Mainland coast important copper mines are being developed. It may, in short, be said that the copper resources of the Dominion are only now beginning to be exploited.

Until recently the greater proportion of the silver mined in Canada was derived from the galena deposits of the Slocan and East Kootenay districts of British Columbia. But some two years ago the phenomenally rich Cobalt silver area was discovered in Northern Ontario, in the same area as the copper, from which, in 1906, a production of something like six million dollars was made. All the leads have been confined to a limited area in this Huronian belt, and there is no reason why equally rich mineral deposits should not be found in the same formation northward.

On the south shore of Lake Superior we find there are belts of Huronian rocks extending into Michigan and Minnesota. These contain immense deposits of iron, and the greatest deposits of iron in the world are just south of Lake Superior. Unfortunately, so far as has been ascertained, the values in these iron ranges decrease when they extend into Canada. But in Michipicoten we have a great iron range, in which have been developed the Helen and other iron mines, and throughout the Huronian rocks low grade ore occurs in considerable quantity. In particular, large deposits have been found in the Temagami district. In the north, in Labrador, extensive deposits of iron have been reported by Mr. A. P. Low, of the Geological Survey, while south of Georgian Bay iron also occurs. In the west, iron of good quality has been found in East Kootenay, while there are extensive occurrences on Texada Island and on the west coast of Vancouver Island, which in due course may be conducive to the establishment of an important industry.

The great demand that has arisen for concrete, for building and other purposes, perhaps justifies a word in reference to the resources of the Dominion in this respect. It may, in fact, be said that in almost every Province we have excellent limestone in unlimited quantity, from which to manufacture cement, and already a cement industry is being established in Canada, which is bound to grow to considerable proportions.

After referring to the possibility of the discovery of diamonds in the Temagami and iron districts in the Huronian belts, the lecturer concluded his remarks by reiterating his belief that Canada has not only great supplies and reserves in coal and mineral, but vast resources as yet undeveloped.

CASSIAR AND THE BERRY CREEK MINE

By Clive Phillips-Wooley

There are some countries which spring at once into notoriety, and are successes from the finding of the first "float" like Cobalt, and there are others which have their preliminary flutters, their subsequent period of comparative neglect, and their ultimate revivals, or second births, like Cariboo.

In spite of some disappointments in the past those who know him believe that "Hobson of Bullion," now that he is to have a free hand and all the money he wants, will make Cariboo the biggest thing yet in hydraulic mining.

The writer doubted of this once himself, but five years of practical experience in hydraulic mining (on a smaller scale it is true) has taught him the necessity of big outlay to achieve success in a big thing.

Cassiar belongs to the same class as Cariboo, which it resembles a good deal in character and history. Between them they make up the northern half of our great Province, and the gold we find in both is found on ancient river channels, probably belonging to the preglacial era.

Like Cariboo, Cassiar had its early rush of "cream skimmers," poor but energetic individual miners, who fought their way into the country in spite of all difficulties of transportation, found gold, and dealt with the richest and most obvious deposits of it successfully, and when they had exhausted the very richest spots which alone could pay under such circumstances as they had to contend with, abandoned the country until the era of companies, hydraulic mining and Guggenheims should arrive.

In Cassiar in 1873, Thibert and McCullough and others, located claims upon Dease Creek, Thibert Creek and McDames, and from these the pioneers and a few thousand of similar character took, with the rudest appliances, some $4,500,000 worth of gold dust; at least the Government collected upon that amount, though how much more was won must be a matter of conjecture.

In those early days, men went by steamer to Wrangel from Victoria; thence by canoe or over the ice up the Stickine for 150 miles, thence they had to pack over a forest trail for 72 miles, boat across Dease Lake and climb in from there to the various creeks upon which their claims lay.

If you will compute how much in the way of grub, blankets and tools, you could transport for yourself over such a route (if you were man enough to get over it at all) and then multiply that amount by three to make allowance for the difference between a western hard-fist and the ordinary man, you will be able to judge of the length of time these men could stay to mine in each season.

The whole of a normal season to-day is only 150 days, but luckily it is not difficult to mine for the whole 24 hours of each day, and the difficulties of frozen ground, big boulders and cement are for the most part absent.

Under such conditions it is not wonderful that the first excitement soon subsided, and by the early eighties the country about the Stickine settled down to its primeval silence. This was the period of the white hunters who wandered about the great river and the lands between Telegraph Creek and the Liard, taking toll of the big game which to-day attracts such a number of sportsmen from the different centres of wealth and civilization.

Then once more the cry was "gold," this time in the Klondike, and British Columbia had the chance of its life, and missed it, because the Senate of the day was afraid that Messrs. Mann and Mackenzie might make too good a thing out of their grant of snow and ice in return for an all-Canadian route, which would have given to our coast towns the trade which has built Seattle. The Senate probably saved Messrs. Mann and Mackenzie some initial disappointment, and set back Victoria half a century, since such trades as that of the Yukon are not offered even in the West more than twice in a hundred years.

About this time various smaller companies sprang into existence, the Cassiar Central Railway Company, which preceded Mann and Mackenzie, and also ended in disaster; the Casca Trading & Transportation Company, which went out of business without a debt and without

a nickel, setting a good example perhaps of business morality and affording an example of the unwisdom of trying to rival the old Hundson Bay Company—and some others.

Eventually, when everyone had lost all the money he had to lose, some of the members of these companies got hold of a piece of property on lease upon Thibert Creek and settled down to learn mining. Their adventures would furnish material for a Ballantyne for life, and what they don't know about the difficulties of transportation and the charms of opening a vast hydraulic property without working capital (assisted fortunately by contributions from the sluice boxes), is scarcely worth consideration.

But luck (you can spell it differently if you please) and the sure knowledge acquired by extensive preliminary tests, that the gold was there, pulled them through, and to-day the Berry Creek Hydraulic Mining Company has probably a better record than most mining properties in British Columbia.

Originally it consisted of seven leases, worked by two No. 2 and two No. 4 giants, and from 400 to 600 miners' inches of water. All that nature could do for us except as to transportation had been done. No one need want a better dump, and in the other essentials of hydraulicing we were fortunate, but we had our business to learn, and every experiment we made showed us that our deposit was larger than we had ever dreamed, and richer, in that, in addition to the coarse gold for which we were mining, we had a good deal of fine gold and a very considerably quantity of osmiridium, of the value of which we had at first no knowledge. All this had been going into the dump. To-day the property consists of ten leases of eight hundred acres each in one continuous body, fronting Thibert Creek for 15,000 feet, the deposit varying in width from 300 to 600 feet, and in height from 50 to 200 feet or more. Our manager in 1905 put the average width at 350 feet and the height at 125 feet, giving an estimated gravel deposit of about 30,000,000 cubic yards, of which not more than 450,000 cubic yards had been washed by the company, and perhaps 100,000 by former miners, of whom one gang took out $80,000 from a piece of ground which the present company could handle in a month.

To-day the mine is being worked by No. 6 giants and 1,000 inches of water, the continuation of which, throughout the season, has been assured, but to work the mine from the best possible business basis, even this should be doubled, as it could be if the necessary money were forthcoming. It is obvious that if the gold in such a deposit could be taken out in three years instead of in sixty, with the same fixed charges, Government fees, manager's and other salaries, the saving in cash in the long run would be enormous.

The net result of the mining operations then, to date may be summed up very briefly. We have at last made, opened and equipped our mine thoroughly up to the standard referred to, and in the intervals of the labor of opening and equipping, have managed to do 150 days of actual washing for gold, although a very great deal even of that time we have been washing the least remunerative top gravel, but in those 150 days we have taken out $63,000 of gold dust, and 150 days is just one normal season.

Towards the end of this season, when we were at last running with our new monitors and our 1,000 inches of water, we were taking out an average of $475 per diem, and just as the mine had to be closed down for the year struck a rich patch which makes us anxious for the commencement of next season. In the words of the managing director, "a thorough clean-up was made in the boxes and cut in No. 2 pit; the bed rock in the cut was picked, and all gold that could possibly be collected, saved. The water supplied by the new ditches had been turned off for the winter, and we only had the small amount brought down by Berry Creek with which to finish the cleaning up in the lower pits.

"To avoid letting any of this water run to waste, we ran again in No. 2 pit for ten hours with a poor head. On walking through the cut after this run I noticed a good showing of gold on the bed rock. Snow fell during the night, and the next day the water was turned off for good, the machinery was dismantled and the year's work was over.

On weighing the gold from the last clean-up, we found that one roasting of amaglam was just a quarter of an ounce short of 500 ounces, and I volunteered to get a quarter of an ounce out of No. 2 cut. I went up with our foreman, but found the snow so deep in the cut that I could not pick up the gold I had seen over night. A stream of muddy water was trickling down out of the pit, and to get any gold at all, we had to lift this water in V-shaped troughs and then scrape the gravel into a pan and save it by hand-washing. In this manner we took out of one small hole, towards the head of the cut, twelve pans of gravel, which yielded $130 in coarse dust and small nuggets

"When it is remembered that it takes sixty pans of dirt to make a cubic yard, these figures are phenomenal, and while I am far from wishing to raise any exaggerated hopes that may not be fulfilled, the results obtained establish without doubt the fact that we are at present mining extremely rich ground."

With adequate knowledge of hydraulic mining, a rare asset nowadays, and ample money for development and working expenses, we might no doubt have done much better.

Had we prospected the pockets of the public and handsomely advertised our property we might have done better still, but as an example of what may be taken out of the gravel itself by hard work and such persistent energy as has been displayed, for intsance, by our managing director (who is also our head piper), Mr. Warburton Pike, this is perhaps not bad.

Besides the Berry Creek Company there are two other hydraulicking companies in Cassiar, but these are still in their initial stages, and when the day comes for dealing with lode mines, *i.e.*, when Cassiar has some transportation facilities, it will be found that the pioneers of the country have their stakes upon some rock which would not be sneered at in any mining camp.

It will be observed that in this article no allusion has been made to the Atlin country, which is, of course, a portion of Cassiar. This is a wilful omission. Atlin is sufficiently well known to the public and is rapidly making itself a good reputation. It has the start in the race. It will do well, if it leads or is in sight of the Stickine country at the finish. Good luck to both of them.

WESTERN COAL RESOURCES

By J. C. Gwillim
School of Mining, Kingston

Prior to 1902 he country west of Fort William was supplied with coal from the following sources:—

Winnipeg, and Manitoba generally, from the Eastern Staes, by way of the Great Lakes to Fort William, and

thence by rail to Winnipeg and the Manitoba towns. Besides this, some of the Souris-Estevan lignite was used for local steam and fuel purposes. The Souris field lies about 280 miles southwest of Winnipeg.

Up to this time practically no coal came into Manitoba from the Alberta or British Columbia mines, partly because the costs were against it. Probably Alberta coal can be laid down at a slightly lower price than Eastern coal in Winnipeg, but the quality is hardly as good as the best Eastern coal. In 1904 farmers in Western Manitoba paid $17 per ton for Eastern hard coal. Semi-anthracite from Bankhead, in Alberta, could now be sold at these points for under $12.

In the Territories the sources of supply were the Canmore and Anthracite mines of Bow Valley, on the main line of the Canadian Pacific Railway, and the Lethbridge and Frank mines on the Crow's Nest Pass Railway.

None of these were heavy producers, their total daily output being under 1,000 tons. The demand for domestic fuel was light and was supplied from Anthracite and Lethbridge. The former mine shipped a semi-anthracite coal as far as the San Francisco market, while Lethbridge lignite found favor as a stove coal in the Territories and in Southern British Columbia.

For the British Columbia interior and some of the Western States the Crow's Nest collieries supplied a good steam bituminous coal, and a superior coke for smelting purposes.

On the coast, Vancouver Island collieries, at Nanaimo, Wellington and Comox, supplied the coast trade and shipped largely to San Francisco.

Up to this time the collieries were easily supplying a very inadequate demand.

Since the year 1902 there has been a rapid increase of settlement and of values throughout the Western country. The demands for steam transportation, domestic fuel and smelter coke have all increased greatly. This increase has caused the opening up of several new collieries in Alberta, chief of which are Taber, Bankhead, West Canadian Collieries, and the International Coal & Coke Company, all of these, except Bankhead, being upon the Crow's Nest Pass line.

None of this coal west of Red River is of the carboniferous period, such as furnishes Eastern America and much of Europe. All the Western coal is cretaceous or later; but owing to conditions of heat and pressure which accompanied the formation of the mountains, it is quite largely bituminous and in a few places semi-anthracite. Wherever the coal is later than the cretaceous period, or is far removed from the mountains, it is a lignite of more or less value, according to the amount of alteration since its deposition. Age, alone, does not determine its quality.

Passing westwards from Winnipeg, the different fields may be summarized as follows:—

Sourise-Estevan Field.—Two hundred and eighty miles southwest of Winnipeg, in rocks later than the cretaceous and similar to those of the Edmonton field, 800 miles west of Winnipeg.

This coal, a lignite at a short depth below the general prairie level, is of only moderate value for fuel and locomotive work. On exposure it crumbles badly, but owing to its position it may hold the local trade against the long haul of Eastern and Western coals. If it can be commercially briquetted it may find a large market.

Taber and Lethbridge Fields.—Seven hundred miles west of Winnipeg. These are cretaceous lignites of good quality, firm and blocky; this coal burns well in stoves, and is used for locomotives during certain seasons. At Lethbridge this coal lies about 200 feet below the prairie level and is mined on only one four to six foot seam, which dips gently westwards.

West of these fields and overlying them is a later formation, which also carries lignite seams. These occur in a strip which runs from the United States boundary up to and past Edmonton. At the latter place they furnish a fair quality of domestic and steam coal for local purposes.

The Mountain Coal Fields.—These seams and strata have been thrown up from their deep-seated position in the lower cretaceous by the eastward thrust of the Mountain ranges. This movement by folding and faulting the coal measures along a N. N. West line within and in front of the first mountain ranges, has caused a number of repetitions of the same coal measures.

It is this repetition and the ease of access by tunneling that make the Alberta bituminous coal a favorable source of supply for the great needs of our own Prairie Provinces and the States to the southeastwards which lack good coal.

This belt of lower cretaceous coals tapers off to a few narrow basins within the mountains as one goes northwards to Yellow Head Pass. It has been traced for about 300 miles in a N. N. West direction from the United States boundary; beyond that point there is an absence of these measures for a space, but this reappears on Pine and Peace River, 300 miles further on in the same direction.

Wherever the folding has been most intense this coal is apt to be badly crushed, but its grade passes from bituminous coking coal upwards through semi-bituminous steam coal to a semi-anthracite, such as that found at Bankhead, near Banff, the head of the south fork of Sheep Creek, and, it is said, some areas in the Crow's Nest field.

Crow's Nest Feld and its extensions up the Elk and Fording Rivers 40 to 70 miles north of Michel are fields of great magnitude in area and total thickness of seams. This coal is especially fitted for the coke so necessary in the smelting operations of the mountain mineral districts.

There is no coal field, in quantity and quality, on the Pacific slope which is likely to rival this region. The States of Idaho, Washington, Oregon and California have little coal of this quality, and it may supply many of the Western smelters as well as some of the Pacific steam service besides the main part of the interior mountain traffic.

Some grades of it furnish fair domestic fuel; north of these Elk River fields the bituminous coal does not appear on the Pacific slope of the first mountain ranges, but is confined to a few narrow strips along the Alberta or Eastern slopes and inter-mountain.

The Interior British Columbia Fields.—These are confined to smaller areas of lignite and low bituminous coal, of which Nicola coal field is the best example in quality. They are of a period later than the cretaceous, are more irregular, and, unless affected by later igneous intrusions, are apt to be lignites of no great value for coking or steam coal. However, they will furnish local transportation and fuel purposes on account of their position from Crow's Nest or Vancouver Island.

Pacific Coast Coals.—These are cretaceous coals of fair steam quality. They occur on Vancouver Island, Queen Charlotte Islands and on the mainland within the drainage basin of the Skeena River. The Vancouver Island coals are mined at Nanaimo, Wellington, Union

and Comox. On the eastern shore they occur as a narrow strip outcropping along the shore and dip gently beneath sea water to the east. The coal here has been estimated to be of great amount, but much of this ground will not furnish the tonnage expected of it. The seams are not numerous nor of great thickness. They also have unworkable areas, but, being as they are on tide water, and having no greater competitors upon the North Pacific coast, will be made to yield to a large market. North of Vancouver Island there are some uncertain areas of bituminous and anthracite coal on Queen Charlotte Islands, which have not yet been extensively worked.

To the east of Queen Charlotte Sound, and within the influence of the Pacific terminus of the Grand Trunk Pacific, there are some areas of bituminous and anthracite coal. These have been prospected and located within late years, more especially within the drainage of Telkwa Siver, in anticipation of the trade of the new Pacific terminus and its railway. They were the subject of an investigation by Mr. W. W. Leach, of the Canadian Geological Survey last summer, and an account of them may be found in the Annual Summary Report for 1906. Between these Pacific fields and Peace River or Yellow Head Pass there is unlikely to be good steam coal; and again between these and Fort William there is little chance of bituminous coal.

Thus the Great Lakes; the first or eastern foothills and ranges of the mountains, and the Pacific coast will be the chief coal distributing points of the future for Western Canada.

To those who are interested in the Western coal resources, there is a fund of information in the reports of the Canadian Geological Survey, especially those made by the late Dr. G. M. Dawson, D. B. Dowling, Jas. McEvoy and W. W. Leach.

THE INTERNATIONAL COAL AND COKE COMPANY, LIMITED

DENISON COLLIERY, COLEMAN, ALBERTA

Among the newer mines being opened up in Alberta is that of The International Coal & Coke Company, Limited, at Coleman, on the Crow's Nest branch of the Canadian Pacific Railway. Although Coleman is only a little over three years old, and the mine has been on a shipping basis for about two years, both have made that progress and development which characterize Western enterprise.

The plant has a capacity of 2,000 tons daily, and is handling at the present time 1,500 tons. No expense has been spared by the company in making the equipment thoroughly up-to-date in every particular, and it may be safely said that the International has one of the most modern plants in the West.



BEE HIVE COKE OVENS—INTERNATIONAL COAL & COKE CO., COLEMAN, ALBERTA

The measures occur in the cretaceous or laramie cretaceous coal-bearing rocks, and are part of the great Crow's Nest field, but, separated from the Crow's Nest Pass field proper by the main range of the Rockies, the height of land coming about eight miles west of Coleman. Two seams are being worked from the drainage level, No. 2 for steam coal, and No. 4 for coke. The dip is very regular in both seams, at from 30 degrees to 32 degrees, and the system of mining used is room and pillar, the sooms being run straight up the pitch, with a sheet iron chute in the centre.

In No. 2, cross-cuts every 60 feet, and rooms 50-foot centres and 10 feet wide, make the pillars 60 feet by 40 feet; a barrier pillar double this size divides a panel of 10 pillars from the next 10; and every tenth room is run to the surface as an air shaft, thus providing the

required split in the air, also a means of lowering timber into the mine as the work advances.

No. 2 is a 14-foot seam, with good roof and bottom, and the pitch is sufficient on the sheet iron chute to carry the coal to the gangway by gravity.

The haulage, which has been found to work very satisfactorily, is by compressed air locomotives, three of which are used, two 5 inch x 10 inch cylinders to collect the trips in the mine, and one 6 inch by 10 inch cylinder to haul the loads to the tipple.

No. 4, or the coking seam, is 6 feet thick, and worked on the same system as No. 2, except that the rooms are 60-foot centres and 15 feet wide, making the pillars 60 feet by 45 feet.

All mining is done by hand, and while the mine cannot be said to be gaseous, safeties are used in all the working faces.

An 11 foot by 6 foot Cappell fan, running at 200 revolutions per minute, and supplying 130,000 cubic feet of air per minute at 1.4 water gauge, is used with excellent results.

All power used in and around the mine is generated at a central station, which is equiped with four 100 horse-power Erie City return tubular boilers, and two 150 horse-power Jenkes return tubular boilers, all at a pressure of 110 pounds.

,Two 400 horse-power Phœnix engines, direct connected with two 250 kiliwat 250 volt direct current Westinghouse dynamos, supply electrical power for the fan, machine shop, tipple, and lorries, and also for the town and mine electric light systems. ,

The compressor for the air haulage system is a 4-stage Canadian Rand machine, high pressure duplex 16-inch by 24-inch steam cylinders, with Myers' riding cut-off valves. The air is delivered at 1,000 pounds pressure to the various charging stations on the surface and in the mine.

The power plant is all under one roof and most modern and efficient in all details.

The Cappell fan mentioned previously has a capacity of 150,000 cubic feet per minute, driven by a 150 horse-power Westinghouse motor, and can be used either as an exhaust or a blower by the manipulation of a system of doors in the fan house.

,The machine shop equipment is electrically driven, and consists of one 30-inch American Tool Company's patent engine lathe, one 24-inch drill press, one 16-inch by 24-inch shaping machine, one bolt threading machine, one 24-inch swing saw, one 18-inch combination table saw, sheet steel shears, rollers and punch.

The blacksmith forges and carpenter shop are under the same roof as the machine shop, making a most convenient arrangement. , ,



The coal is hoisted from the yard level to the tipple floor on two automatic self-dumping cages, working in balance.

No. 2 coal passes over a bar screen to a link belt picking table, and from there to the storage bins directly under the end of the picking table.

The No. 4, or coking coal, passes from the tipple floor into a 9-foot Bradford breaker and reduced to half inch and smaller before going to the slack bins.

An Ottumwa Box Car Loader handles the coal from the storage bins, which have a capacity of 2,000 tons for lump, and 1,000 tons for slack.

The slack from the Bradford Breaker is conveyed by two electric lorries (of 6 tons capacity each, and equipped with 35 horse-power Westinghouse motors) to the coke ovens, of which there are at present 176, of the beehive type, 12 feet by 7 feet 5 inches, with a capacity on hour coke of 300 tons per day.

The product of the mine is used to a large extent by Western railroads, both in Canada and the States, the supply falling considerably short of the demand.

The coking plant is also taxed by the ever-increasing demand from British Columbia smelters, and the coal mining industry generally, while yet in its infancy as compared with the Eastern fields, bids fair to rival Pennsylvania and Nova Scotia in a very few years.

RECENT DEVELOPMENTS IN METALLURGY

By S. F. Kirkpatrick

Professor of Metallurgy, School of Mining, Kingston

In the following paper I do not intend to give an exhaustive resume of the various improvements in the art or science of metallurgy, but rather to show by a few examples what great advances have been and are being made in that direction.

The statistics of the production of the principal metals in the last few decades is instructive, showing that in the last forty years, from 1865 to 1905, the yearly output of gold has increased threefold. In the same time the annual production of silver has increased 4.7 times, the production of copper 7.7 times, the production of lead 5 times, the production of zinc 6.2 times, the production of pig iron 6 times, and two new metals which were not formerly produced on the commercial scale are sold to-day in large quantities, namely, nickel and aluminium. So the consumption of metals generally in 1905 was approximately six times as great as in 1865, and it might be well to note that the yearly increase was never so great as it is at present.

Now, how is it that the supply has been able to keep up with this ever-increasing demand of the manufacturing and commercial world?

Firstly, no doubt, by the opening up of the mineral wealth of new countries and the increased transportation facilities which puts formerly inaccessible ore deposits within reach of a market and also in many cases by the settlement of new districts bringing the market to the ores.

Besides this, however, there is another important force; in the increased engineering and metallurgical skill brought to bear on the mining and treatment of the ores, so decreasing the cost of recovering the metals that lower grade and more refractory ores can be treated at a profit. The metallurgical treatment of the various ores is sometimes the development of years or centuries; and so-called standard methods of treatment have been devised. But there is always a gradual improvement in the details of the manipulation, the result of the combined energies of all the metallurgists in charge, so that in the course of time from a crude evolves an efficient process. This change is slow but steady, for engineers are generally conservative, and if a process or machine works satisfactorily they will not discard it for an untried device, even if that device gives promise of very considerable advantages.

So it does not follow, because a particular process or furnace is the standard type, that it is the best device that could be employed. Possibly if another process or type of furnace had been first introduced it would have succeeded better. Sometimes we find the same class of ore treated by entirely different methods in different countries, and it may be some time before one of the processes is developed to such a point that it can show itself so superior to the other as to replace it.

Besides this gradual advancement there is occasionally a radical change made in the method of treatment. This may be due to the work of some one man who will conceive an idea and work out and prove his views until, with the help of a commercial plant, he will convince the most conservative metallurgist of the value of the process.

In many cases, however, this radical change of method will be forced by some external cause, such as a change in the grade or character of the ore treated, or a decrease in the market value of the metal produced, so making the standard method formerly employed no longer profitable. Then it is that the metallurgists compete to overcome the difficulty and nowhere could the old adage, "Necessity is the Mother of Invention," be more true; for a new method is nearly always found. For the metallurgists are only woking on the threhold of a science, the possibilities and limitations of which it is hard to state.

Take the case of smelting of iron ores for making pig iron crude cast iron. The first blast furnaces were introduced in Germany and England about the 14th century. The same general process is used to-day; but the early smelters would have considered half a ton a good day's output with a consumption of two to four tons of charcoal per ton of iron, while last year one of the large Pittsburg furnaces made 900 tons of pig in 24 hours, probably using only three-quarters of a ton of coke per ton of iron.

This great change can not be attributed to any one time or man, but rather to the gradual evolution marked by some few decided advances, such as the introduction of coke in place of charcoal in the seventeenth century, the introduction of the hot blast in 1828 by Neilson, and later the construction of the furnace with a closed top, so saving the waste gases that contain a large percentage of carbon monoxide; and this inflammable gas is used to heat the blast and supply all necessary power used around the plant.

The development in the smelting of copper ores in the last few years is quite marked. Twenty-five years ago small furnaces of brick were used that would treat from 30 to 100 tons of copper ore per day; and it was considered that an ore should assay from six to eight per cent. copper to be a good financial proposition.

These small furnaces worked slowly and somewhat erratically, requiring constant repairs and were very subject to the worst disease of a furnace, namely, a freeze-up.

Before the scientific days of copper smelting, when many of the furnaces were in the hands of the so-called practical metallurgist, who had rather a contempt for chemistry, this was considered unavoidable and the following story was much appreciated by the copper fraternity. A boastful metallurgist when visiting a large copper smelter remarked to the foreman in charge that he had never had one of his furnaces freeze up. The foreman looked at him for a minute or two and then remarked: "Well, friend, you are either a blank liar or you hain't had much experience."

The modern furnace, although subject to accidents, is a much more perfect machine. It is usually in charge of a technical metallurgist and can be counted on for continual operation, treating from 400 to 1,200 tons of ore per day.

This improvement has been gradual, but, as in the case of the smelting of iron, occasional great strides have been made, as in the replacing of the brick furnace by one constructed of iron water jackets, the introduction

of mechanical charging devices and in general the replacing of hand labor.

Another item of importance is the decreased use of fuel, such as coke.

In the old process for treating an ore high in sulphur (30-45 per cent. sulphur), it would be first roasted to remove a large percentage of this element, then smelted in a blast furnace with fluxes and from 12 to 20 per cent. of coke to form a copper matte containing 30 to 40 per cent. copper with iron and sulphur. This matte would then be roasted to remove more sulphur, and again smelted and possibly after on more roast copper could be obtained in a reverbatory furnace with a consumption of from 20 to 40 per cent. of fuel.

Now such an ore is treated in a blast furnace directly with little or no coke, and the heat required for melting the charge is produced by the burning of the sulphur and the oxiding of the iron, so making a 30 to 50 per cent. copper matte in the first fusion. This copper matte, while still hot, is tapped and run into a barrel-shaped vessel called a converter. Air is forced up through the molten matte and the remaining sulphur is burnt to sulphur dioxide, which passes off as a gas. The iron is oxidized, then slagged with silica, leaving the copper fairly pure. The heat generated during this reaction is sufficient to keep the copper perfectly molten, so that it can be poured into moulds.

By this method sulphur has been converted from an enemy into a friend.

The general reduction in the cost of melting allows of ores being treated to-day that formerly would have been of no value.

In some few cases the metallurgical treatment of certain ores has remained nearly stationary for years or centuries, to be suddenly disturbed by the introduction of some new revolutionary method.

Mexico, the old silver camp of the world, is now undergoing such a change.

When that country was first opened up by the Spaniards in 1557, the Patio amalgamation process was introduced for working the silver ores, and this or analogous amalgamation methods have been operated almost continuously ever since, many of the individual mines having produced from $100,000,000 to $500,000,000 worth of silver.

About three years ago successful attempts were made on a commercial scale to introduce the cyanide process, in which the silver is dissolved out from the ores by a dilute solution of potassium cyanide and then precipitated from this solution by zinc or deposited by a current of electricity.

Now cyanide plants are being erected as energetically as possible in many parts of that country, and we may confidently expect that in the future the cyanide process will be responsible for a large percentage of the world's silver. On account of the decreasing cost of treating ores it is possible to treat grade ores not formerly mined. This was by no means the first time that the cyanide process was employed, for the process was devised about 1886 for the treatment of gold ores, being particularly adapted to low grade ores.

A large percentage of the world's gold was and is obtained from its ore by the process of amalgamation. In but few cases does the stamp battery extract all the values, and a long-felt want was supplied when it was found that most of the gold left in the tailings or waste from the gold mill could be extracted by means of cyanide.

From the time the process was first used it has been steadily developed, till now there are few stamp mills without a cyanide plant, and it is claimed by some authorities that directly or indirectly the cyanide process is responsible for over 50 per cent. of the world's gold.

Now, turning again to the statistics of the production of the metals in the last forty years, the question arises, What about the future? Will the available ore deposits be sufficient to suply the demand?

Much speculation has been indulged in and much has been written on this subject, particularly as regards the future of iron and fuel coal.

No doubt the output of iron must continue to increase, but at what rate we are not able to foretell. If we were to assume that the percentage of increase would be the same for the next 200 years as for the past 40, we would get some astonishing figures; but such an estimate would be entirely wrong.

Some of the iron ore deposits of the world now being mined are very large, but it is doubtful if there is 100 years' supply in sight.

But, no doubt, particularly in the new countries, many new deposits will be found of equal richness, and, moreover, there are immense quantities of rock so low in iron as not to be classed as ore at present that will, without doubt, be successfully worked by metallurgists of the future. These low grade or bodies are even now being mined and made into high grade ore by magnetic concentration. It does not require very much foresight to say that the world need not go without iron and steel as long as there is rock containing 10 to 20 per cent. iron. Even at the present time it looks as if it would pay to treat many of the low grade iron deposits if they are favorably located. (In many cases we can mine an ore and concentrate it for less than $1 a ton, and so we could concentrate 15 per cent. iron ore up to 65 per cent. for about $5 per ton.) The value of iron ore at Lake Erie docks would be approximately this.

We are probably only at the beginning of the development of the world's copper fields. Particularly in the new countries. The United States is now the great producer, yielding 56.7 per cent. of the total yearly production in 1905, and will probably continue to be the most important source of supply for some years to come, particularly as active development is being undertaken in Alaska. Then Canada and Mexico and even South America are rapidly coming to the fore, and Asia and Africa have great possibilities as copper producers.

Copper, however, is not a widely distributed metal like iron, and even low grade deposits are not common.

In the last forty years there has been a greater increase in the consumption of copper than of any of the common metals.

An interesting estimate of the future production of copper based on the rate of increase in the past is given in Stevens' Copper Hand Book.

The average yearly increase during the nineteenth century was slightly over 4 per cent., and for the last decade nearly 8 per cent. At 4 per cent annual increase the production of copper in 1950 will be 3,700,000 tons, and in the year 2000 28,000,000 tons; or at 8 per cent. yearly increase the production for 1950 will be 19,900,000 tons, or, in the year 2000, 811,800,000.

These last figures are of course on entirely hypothetical data, for if the latter figures were correct nearly all the able-bodied men in the world at present would be required to produce copper. But on the most conserva-

tive estimate, the demand for copper or some metal that can take the place of copper as an electric conductor, will grow and it is an interesting speculation as to where this supply will come from.

This question was discussed a number of years ago, and many writers enthusiastically declared that the new white metal, aluminium, then being put on the market for the first time, was the metal of the future, and the solution of the difficulty. This idea has had a considerable setback, for, although aluminium has been on the market for a number of years, selling at a little over thirty cents per pound, nothing revolutionary has happened and several producing aluminium works got into financial difficulty. However, the consumption of aluminium has gradually increased, and the metal is becoming better understood. Possibly now with the high-selling price of copper the uses of aluminium may be developed.

As regards the other base metals, the same fear might be expressed of an ultimate shortage, as in the case of copper, but to a less extent. Possibly in the far future aluminium may replace even these metals for many of their uses.

As for the precious metals, silver and gold, I will not attempt to foretell the future demand, but leave it for the economist, banker, statesman, etc., to determine what percentage of these metals are necessary. I might hazard the opinion that gold with all its attractions is not an essential good or evil.

IRON MINING IN NORTHERN ONTARIO

By A. B. Willmott

Sault Ste. Marie, Ont.

During 1906 the exploration for iron ore throughout Northern Ontario has progressed with vigor, and some discoveries of importance are reported to have been made. The known iron ranges of Ontario now surpass in numbers the various ranges on the south shore of Lake Superior, but beyond the rough outlining of the ranges comparatively little exploratory work has been done. The tendency has been to locate the iron ranges, comply with the Government regulations, and then to hold the lands for sale, or as possible sources of future or supplies. Speculative holders have done the former, whereas large iron consumers have done the latter. In very few cases have actual ore bodies been proved by exploratory work. Undoubtedly were our iron ranges located south of the international boundary line a vastly larger amount of diamond drilling, test pitting and other exploratory work would have been done, with a view to finding ore bodies. Our newspapers and public men are accustomed to speak of the large iron deposits in Ontario, when as a matter of fact there has been up to 1906 but one shipping mine worthy of note. It is true that the surface indications and geological conditions lead us to infer that iron ore may be found in quantity in Ontario, but with a few exceptions this supposition has yet



BLAST FURNACES AND UNLOADING DOCKS, ALGOMA STEEL CO., SAULT STE. MARIE

to be proved. The following notes give a brief description of the more important work of the past year.

The Atikokan Iron Company have connected their mine with the Canadian Northern Railway, and will be ready to ship ore in the spring of this year, and by that time the furnace which is being built for them at Port Arthur is expected to be completed. The ore is a high grade magnetite, low in phosphorus but high in sulphur, so that the ore must be roasted. The company are installing their own coke ovens for the manufacture of the coke required, and will use the by-product gases for roasting the ore. The completion of this furnace should open a market for a considerable quantity of the low grade ores in the Port Arthur district which are not rich enough in iron to stand the expense of long shipment.



HELEN MINE

During the year a discovery has been made of hematie ore, about ten miles northeast of Port Arthur. The ore lies near the surface, and it is expected can be mined by steam shovel. The Dominion Mines & Metals, Limited, has been formed with a capital of $1,000,000 to operate this and other properties, and they are pushing their development work actively. A railroad of several miles will have to be built to connect with the Canadian Pacific Railway, and the ore will be shipped over the Canadian Northern Railway docks at Port Arthur. The company hope to begin shipments during the season of 1907.

The Loon Lake properties, owned by Messrs. Marks and Wiley, Hogan, Flaherty and Knobel, are under option to a company of American capitalists. A considerable part of the purchase price has been paid, and the purchasers claim to have several million tons of hematite ore in sight. There is little doubt but that the purchase will be completed. With the property goes a railway charter for a road from the mines to Thunder Bay, between four and five miles distant. Ore docks are to be built there, and will afford cheap transportation. Compared with other ranges round Superior this rail haul is very short, and should offset the extra cost of mining which is likely to occur. The ore is of good grade, but lies flat, and is bedded with lean portions which will have to be picked out.

Nothing has been done during the year with the iron ores lying east of Lake Nipigon, in the vicinity of Poplar Lodge. Dr. Coleman, of the Bureau of Mines, has made a careful study of these ranges, and his report should shortly appear. The right-of-way of the Nipigon Railway from Lake Superior to Lake Nipigon is now being cut out, and it is expected that construction will shortly start. The completion of this road will make possible the shipment of ore from these Nipigon ranges, and should encourage active development. Sixty miles to the northeast of Poplar Lodge other iron-bearing lands have been taken up by the United States Steel Corporation and others, but no development work has been done.

In the Michipicoten country some claims have been taken up near Pucaswa, showing rather lean magnetite on the surface.

Nothing has been done on the Iron Lake or Frances Mine properties during the year. At the Josephine Mine operations by the Algoma Commercial Company, Limited, were stopped because of a dispute regarding the title to part of the property.

Operations at the Helen Mine were seriously hampered by a fire which in the early summer destroyed the crusher building and machine shop. New buildings were erected, much more convenient than the old ones, and the latter part of the season the output was increased to normal proportions. The toal shipments for the year 1906 were 121,555 long tons, making the total shipments from the mine to date about 1,200,000 tons. This is by far the largest amount of iron shipped from any iron mine so far exploited in Ontario. It is expected the shipments for 1907 will be considerably larger than for 1906. The ore shipments for 1906 have been marketed in the United States and at Hamilton and Sault Ste. Marie, Ontario.

Some prospecting was done along the Algoma Central Railway north of the Soo, but nothing of consequence was found. The Williams and Breitung properties are at present closed.

At Moose Mountain, forty miles north of Sudbury, considerably surface work was done during the year, the land being cleared and camps erected. The Canadian Northern Railway was graded from Sudbury to the property. This winter ore docks are to be erected at Key Inlet on the Georgian Bay. The management fully expect to be shipping ore sometime during the summer. A very considerable body of magnetite of high grade is exposed on the surface of a hill, and the mining will be open quarry work for some time.

At Temagami some exploratory work was carried on by the Temagami Iron Mining Company during the past summer. This company have two and a quarter miles of banded jasper and iron ore, and are searching for the concentrations which are likely to occur at points along the range. The surface of the property was carefully examined by trenches and test pits, and a little diamond drilling done. The work is to be continued this year.

In Boston township, on the Temiskaming & Northern Ontario Railway, a somewhat similar deposit is being explored; diamond drills are at work this winter testing the property.

In Eastern Ontario some small trial shipments of ore were made from the Farnum property in Hastings county. The ore is a high grade magnetite of bessemer grade. A branch of the Central Ontario Sailway was built into the property during last fall, and the management expect to ship 100,000 tons during the coming summer.

The consumption of iron ore in Ontario is rapidly increasing. Last year there was in the neighborhood of 280,000 tons of pig iron produced, which represents over 500,000 tons of iron ore. Of this only a small part was furnished from Ontario mines, the remainder being imported from the United Sates. As the revised bounties adopted by the Dominion Government are now more favorable to Canadian ores, we may look for an increase in the shipments from Canadian mines. Unfortunately there are almost no companies in Ontario attempting to supply iron ore. There are a great many firms and syndicates willing to sell reputed iron properties for large sums, but almost none have faith enough in their properties to develop them and sell iron ore. It is to be hoped that the new bounties will stimulate owners of iron lands to become ore producers.

DIMITRI IVANOWITCH MENDELEEF

By W. Hodgson Ellis

Few men have left a deeper impress upon the scientific thought of our time than the great Russian chemist, the news of whose death has just reached us. His name will rank among the chemists of the latter part of the nineteenth century, as that of Dalton did among those who flourished at its beginning.

Distinguished no less as a patient and accurate investigator, than as a profound philosophical thinker, and while his brilliant speculations have illuminated the whole field of chemistry, and have proved a lantern to lighten the feet of a host of explorers in the paths of pure science, he was equally strenuous and equally successful in the endeavor to turn the searchlight of science on the problems of daily life and aid in developing his country's resources.

Siberia is hardly the place to which the eyes of the world would look to await the coming of a prophet of science, nevertheless it was there that the discoverer of the periodic law was born, just seventy-three years ago. His father was director of the gymnasium (high school) of Tobolsk. His mother, like so many of the mothers of great men, was a remarkably capable and energetic woman. While Dimitri, who was the youngest of her seventeen children, was still an infant, her husband became blind, and the care of the family devolved upon her. This task she fulfilled in an admirable manner. She established a glass works, to the management of which she brought so much ability and industry that it became a successful concern, and she was able to keep her charges in comfort and give them a good education. Her youngest son, after passing through the gymnasium at Tobolsk, was sent to the University of St. Petersburg to study chemistry, with a view to assisting in the management of the works. For some reason, however, he University, and, after finishing his studies there, he bechanged to the Pedagogical Institute, connected with the came a teacher in a gymnasium in the Crimea. On the breaking out of the Crimean War he removed to Odessa, and shortly afterwards became Privat Docent in the University of St. Petersburg. Here he began a series of researches on specific volumes, and showed such promise that the Russian Government sent him to Heidelberg, where he pursued his studies for two years. In 1863 he was made Professor of Chemistry at the Technological Institute of St. Petersburg, and in 1866 he obtained a similar chair in the University.

His researches on specific volumes, begun in 1855, were continued during fifteen years. Since 1870 much of his work has been devoted to the elasticity of gases.

It is, however, as the enunciator and elucidator of the periodic law that the name of Mendeleef is most widely known. In 1869 he read a paper before the Russian Chemical Society, in which he showed that "the properties of the elements are a periodic function of their atomic weights." In this and subsequent papers he elaborated this idea and arranged the elements in the order of their atomic weights, showing how they fall into groups in the manner now so familiar to us as "Mendeleef's table."

Mendeleef was not the first to arrange the elements in such an order, nor the first to point out the periodicity of their properties. Newlands, in England, and De Chancourtois, in France, had done this several years before. But no one before had worked out the problem so thoroughly, so logically, and so successfully. Even then

chemists were by no means eager to accept the idea. But when, in 1875, Lecog de Boisbandrau discovered gallium and described its properties, Mendeleef pointed out that he had predicted in 1871 that a gap in his table corresponded to an undiscovered metal which he called eka-aluminium, and to which he had ascribed properties which exactly corresponded to those of the new metal. Subsequently two other predictions, ekaboron and eka-silicon, were fulfilled by Scandium and Germanium. The scientific world was taken by storm.

The new law was accepted by acclamation, and ever since it has been of the utmost service in suggesting lines of investigation and pointing out the probable road to truth. It is interesting to note how all the principle nations of Europe assisted in the establishment of this law. The law was first announced in England; the atomic weights upon which it is based are those of an Italian, Canzzaro; it was developed and formulated in Russia; and France, Scandinavia and Germany each contributed a new element to prove the correctness of its predictions.

But Mendeleef did not confine the energies of his powerful mind to speculations, or even to investigations, in pure science. He was at all times ready to place his talents at the service of his country.

It was largely due to his efforts that the monoply which had paralyzed the oil industry of Baku was removed. The enormous development of the industry which followed this step is familiar to everyone. He was sent by the Government to the Caucasus and to Pennsylvania to report on the wells and refineries in those localities, and his reports were of the greatest value to the scientific and industrial world. He made a study of the specific gravity of mixtures of alcohol and water for revenue purposes, which was a model of careful and accurate work. Indeed, through his life he was employed by the Russian Government in researches of various branches of industrial chemistry, and has been, since 1893, chief of the Bureau of Weights and Measures at St. Petersburg.

It is characteristic of him that, while engaged in useful investigations and thoroughly sympathizing in their object—the betterment of the condition of his countrymen—he never lost sight of their scientific side.

As a result of his work on the density of alcohol, he developed a theory of solutions; and his study of the oil deposits led to his well-known theory as to the origin of petroleum by the action of superheated steam on metallic carbides.

Mendeleef was no philosophical recluse. He held strong views on social and political questions, and was at all times ready and willing to assert them in the press or upon the platform. He was an enthusiastic protectionist, and strongly advocated a tariff framed so as to build up the industries of Russia.

He was a member of the Council of Commerce and Industries.

A plebiscite was recently taken in France as to who was the greatest Frenchman of the nineteenth century. It is a most gratifying evidence of that strong common sense which distinguishes the French people, that Napoleon came low on the list, while at the head of it, with a large majority, stood Pasteur. I do not know whom the people of Russia would name as the greatest Russian of the nineteenth century, but if genius of the very highest order devoted to the successful investigation of nature and a life consecrated to the service of his country constitute greatness, then Russia can claim no greater son than Dimitri Ivanowitch Mendeleef.

CORRESPONDENCE

The Canadian Mining Journal, while it welcomes letters on current topics, is not responsible for opinions expressed by its correspondents.

Speculation in Mining Stock—A Suggestion

To the Editors:—

Sirs,—As I am sure that you intend in your new *Mining Journal,* which I am glad to welcome, to discountenance all wild speculation in mining stock, such as we witness to-day in the Cobalt mining district, will you kindly give me a little space for a few remarks on this subject?

A very rich mining district has been found at Cobalt, but it will not be of permanent benefit to our Province if from day to day and from week to week the manufacture of millions of dollars of paper money continues to be sanctioned and authorized by our Provincial Government under the form of "stock certificates" of the numerous new Cobalt mining companies daily incorporated and chartered by the Provincial Government. There seems to be no stop to it. Every new week brings its fresh millions, and the Department of the Secretary of State is overworked and has been for months granting out new charters, permitting such terrible onslaughts on the savings of the public.

Will no one stop this disgraceful and most dangerous gambling? The Government becoming somewhat alarmed has given a warning in the Speech from the Throne at the recent opening of the Legislature, but it seems to me, Mr. Editor, that in such a crisis we want more than an academic warning, even though it comes from the throne. It seems to me that we should have an effective remedy and a prompt one. Surely we have a right to expect this from the Government, which justly prides itself in having stopped the Toronto Junction and Fort Erie poolrooms shortly and quickly after it came into power. To stop this one form of gambling and, on the other hand, to continue to sanction and authorize another form of gambling much more insidious and in which larger sums are at stake, is an anomaly which the Government should not tolerate. As it is at present, the Government not only tolerates this gambling, but in fact creates it by the granting of their own charters to any new company for any capitalization named and without any restriction whatsoever.

But now is the opportunity for the Government to at once check this, as the Hon. Mr. Hanna has just introduced a new Companies' Act, which I notice was read the second time yesterday, and the details of which were referred to a committee. Let this new Act provide that before a charter is granted it will be proven to the satisfaction of the Secretary of State that ten, fifteen or twenty per cent. of the total capital stock petitioned for has been paid into the treasury of the company and stands there *bona fide* for the purposes of the company, and at once it will become impossible to have in any new district three or four hundred million dollars of capitalization on, mostly, wild schemes. A similar provision is to be found in the Dominion Companies' Act, and it seems to me is a simple, sure and safe remedy for the Government to adopt to protect the public, and I earnestly hope that this provision will become a part of the new law.

Yours very truly,

Eugene Coste.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Cariboo.

The heavy snowfall this winter assures an abundant water supply for gold placer mining in Cariboo district the ensuing season, and, consequently, the recovery of gold should be larger than during the two seasons past. It may not be expected to show any considerable increase, though, until after the Cariboo Gold Mining Company (the Guggenheim organiation that early last year acquired the property of the Consolidated Cariboo Hydraulic Mining Company, which had for years been operating at Bullion Quesney mining division under the managment of John B. Hobson) shall have largely increased its water supply and thus provided for a full season's gravel washing each year. The work of bringing in more water is not likely to be sufficiently advanced to admit of this company recovering much gold in 1907. Several hydraulic mines in the Cariboo division of this large district should, however, yield more gold than during recent years, for much of their dead-work has been completed and their water supply increased. The two chief deep drift mining companies, the Cariboo Consolidated, Limited, operating at La Fontaine on Lightning Creek, and Slough, Creek, Limited, on Slough Creek, should this year add to the production of gold from this district. The former last season during two or three late summer and fall months recovered sufficient gold to pay operating expenses, and the outlook is that the great flow of water from the ancient river channel tapped will be still further kept down and more rich gravel be taken out and washed. At Slough Creek additional steam power, a large winding engine and two 500 gallon skips will supplement the work of the big pumps, so that here, too, the water should be disposed of to an extent that should admit of the mining of gold-bearing gravel with resultant good returns.

East Kootenay.

The St. Eugene lead-silver mine at Moyie, owned by the Consolidated Mining & Smelting Company of Canada, continues productive and still possesses large reserves of ore. Its output of shipping products during the calendar year 1906 consisted of about 3,500 tons of crude ore and 25,000 tons of lead concentrates. The mine is stated to now be in a better condition than at any previous time in its history, recent underground work having disclosed the occurrence in the lower levels of the mine of big chutes of ore, the existence of which was not known before.

The Sullivan mine is maintaining its average weekly production of 500 to 600 tons of lead ore, which is reduced at the company's smelter at Marysville, a few miles from the mine. The North Star and Stemwinder, near Kimberly, are both being worked. On the latter has been discovered a big body of ore, which is reported to need concentration before shipment to the smelter.

Deep snow and severe cold have made the hauling of coal and coke from the Crow's Nest Pass Coal Company's colleries difficult, so that production is not as large at present as when transportation conditions are favorable. Notwithstanding this the Coal Creek mines made a record output on January 29th, with a tonnage of 2,600 tons. When the weather shall again be mild and sufficient railway cars be available, the production of this company's mines will no doubt soon reach a larger monthly total than in any previous year. The demand for Crow's Nest Pass coal and coke is active, and, given adequate transportation facilities, will continue to steadily grow.

Cassiar.

At Atlin, too, prospects are good for an increased yield of gold next season, for on two or three of the richer creeks the claims of the individual miners have been bought out by companies which will operate on a much larger scale and with power appliances that will handle considerably more gravel than has been washed in past seasons.

The Atlin Consolidated Mining Company, stated to be a Guggenheim enterprise, during the forty-one days it was able to wash gravel on Pine Creek after the installation of its seventy-five-tone steam shovel and system of electrically operated dump cars last season, found this method of working profitable; so it is understood to intend to put in two more steam shovels.

The two Ruffner Companies—Pine Creek Power and North Columbia—have made provision for an abundant supply of water for their operatons on Pine Creek. It is estimated they will have a supply of 5,000 inches per day during the whole of the washing season.

The Amalgamated McKee Creek Mining Company purposes installing a steam shovel. This and another company, Hamshaw Bros., of New York, are largely interested in, are stated to have been working economically and making good profits. The French company, known as the Societe Miniere, operating on Boulder Creek, is also reported to have done well and to have excellent prospects for the coming season.

In Northern Cassiar the Berry Creek Mining Company has about completed its deadwork and the management expects that the coming season's returns will well repay the company for its outlay during the several years it has been doing preparatory work—bringing in water, installing hydraulic equipment, erecting buildings, etc. After completing its water supply system last season gold to the value of $21,750 was recovered during 109 24-hour days' gravel washing. As much top dirt had to be hydraulicked before pay gravel could be washed, this result is regarded as much below what will be achieved this year with the pits in shape for work under more favorable conditions. From one pit an average of $475 per diem was obtained last season during a run of twenty days.

West Kootenay.

Ainsworth mining division has a number of lode mines at work. In the old Ainsworth camp the west side of Kootenay Lake, the sale last fall of the Krao mine to Butte, Montana, mining men, directed much attention to the camp, interest in which has been revived by the discovery late in the summer of rich silver ore in the Krao. A number of properties that had long been idle are now being worked, and prospects are good for a busy year and an enlarged production of ore.

Across the lake the Blue Bell is being developed and has big showings of ore, which the Canadian Metal Company, owning this mine, purposes concentrating before shipping to the smelter. The erection of the concentrating mill will probably be undertaken shortly, the manager of the company, S. S. Fowler, having already prepared plans and had levels run for bringing in water. The development of the Argenta, situated on Hamill Creek, at which a power plant was installed last autumn, is being proceeded with. Several mines on the south fork of Kaslo Creek are showing up well under

development. The Cork mine and concentrator have been proving satisfactory to their French owners. The Province and Montezuma will have their own concentrator in operation later this year. Both the Whitewater and Whitewater Deep, in Whitewater camp, are being operated under lease. A big tonnage of ore and concentrates is accumulating at the Kootenay Ore Company's sampling works at Kaslo, awaiting orders for shipment to the smelters.

In the Slocan work is being continued on mines in the McGuigan, Sandon, Cody, Three Forks and Slocan Lake sections of this extensive district. At the Rambler-Cariboo the raise to connect the deep-level tunnel driven at 1,450 feet depth with the bottom of the 800-foot shaft, is approaching completion. It is reported that ore of good grade has been met with in this raise and that the prospects for the mine are promising. Among the mines around Sandon that are being worked are the Payne, Last Chance, American Boy, Ruth and Richmond-Eureka. In the vicinity of Slocan Lake, the Standard, Vancouver Group and Hewitt are most prominent, while about Slocan City the Ottawa and Arlington, among others, are being further developed.

About Nelson the La Plata mine and mill on Kokanee Creek are being operated. During the first five weeks of the year about 2,200 tons of ore were milled, and between 400 and 500 tons of product shipped to the smelter. The Eureka, a copper property, is being steadily developed, and several gold properties in the vicinity of Nelson are also at work.

Financial arrangements have been made in London to provide for a resumption of work at Ymir gold mine. Some high grade silver ore has been encountered in the Hunter V. mine, which has arranged to maintain regular shipments of its lime-silver ore to two or three district smelters. The Second Relief, Queen, and Arlington, in the Salmo-Erie section of Ymir district, are all making satisfactory progress.

Rossland mines are developing most satisfactorily. The Consolidated Mining & Smelting Company of Canada has extended its holdings here, these now including the Centre Star, War Eagle, Iron Mask. Enterprise and Idaho. The first named two are being explored at considerable depth, their main shafts being the deepest in the Province. The tonnage of ore available for mining is stated now to be larger than at any previous time since these mines were opened. The big working shaft of the Le Roi is being deepened; it is now down about 1,600 feet. Le Roi No. 2 is keeping up its shipments of first-class ore to the Trail smelter, and is milling lower grade ore at its own concentrator. Its production during five weeks of this year was about 2,200 tons. The Consolidated Company's mines produced about 6,000 tons and the Le Roi 12,000 tons during the same period. The White Bear is developing an ore chute on its 800-foot level; this gives promise of proving sufficiently productive to shortly admit of a fair tonnage being shipped regularly.

Boundary.

Between a shortage of fuel and the unusual severity of the winter, the big copper mines of the Boundary district have been operated under much difficulty. This will be evident when it is pointed out that the output of the Granby Company's mines during January was less than 1,000 tons per day, while notwithstanding the interruption caused by the coal miners' strike last autumn, their daily average production for the whole of 1906 was about 2,200 tons. There is not likely to be much improvement until the difficulties mentioned shall have been removed.

Beside the Granby mines, those of the British Columbia Copper Company and the Dominion Copper Company have been working as best they could under conditions far from favorable. All three companies have kept their respective smelting works in operation, but necessarily below their full capacity. It is hoped, though, that mines and smelters will be again operating on their customary scale before the close of February.

In the Similkameen, weather conditions have also been against the working of the Nickel Plate mine and the forty-stamp mill at Hedley. It is probable that here, too, conditions will not long remain unfavorable.

Coast.

Official figures of production of ore at the Britannia mine, owned by the Howe Sound Copper Company, which last year acquired the mining property of the Britannia Copper Syndicate and the smelting works of the Britannia Smelting Company, show that 108,396 tons of copper-gold ore were mined in 1906. Of this quantity 65,844 tons were milled at the company's concentrating works at Britannia Beach, Howe Sound, producing 12,612 tons of concentrates, which, together with 35,726 tons of crude ore, were shipped to the Britannia smelter at Crofton, Vancouver Island, and 6,826 tons of ore went to other smelters. The tonnage smelted at Crofton during the year was as follows: Britannia ore, 20,546 tons, and concentrates. 11,393 tons; Mt. Andrew (southeast Alaska) ore, 3,445 tons; custom ores, furnace products, foreign matte, etc, 19,208 tons; total, 54,592 tons. The production of metals was: Copper, 4,409,560 lbs.; silver, 38,265 ounces; gold, 5,261 ounces. Improvements recently made at the smelter are expected to add considerably to the treatment capacity of the works.

The Tyee Copper Company has deepened the main shaft of its Tyee mine at Mt. Sicker to 1,250 feet, and sinking is still in progress, the intention being to reach the 1,450 foot level in the spring. Low grade ore has been met with on the 1,000, 1,150 and 1,250 foot levels. Concentration tests are being made, the company planning to concentrate the large tonnage of low grade ore developed in the mine. The shaft on the company's X. L. claim, adjoining the Tyee, has been sunk to 550 feet, and further sinking is to be undertaken here. The quantity of ore treated in 1906 at the Tyee smelter at Ladysmith, Vancouver Island was: Tyee ore, 23,823 tons; custom ores, about 5,500 tons. The metals produced were: Copper, 2,115,617 pounds; silver, 77,085 ounces; gold, 3,776 ounces. The total value of these products, after deduction of cost of refining and purchase of custom ores, was $396,500.

The Wellington Colliery Company during 1906 mined 790,018 tons of coal in the following proportions: Comox (Cumberland) mines, 408,901 tons; Wellington (extension) mines, 381,117 tons. Coke made during the year at the company's ovens at Union totaled 13,058 tons; total sales in 1906, including coke taken from stock, were between 17,000 and 18,000 tons. The Western Fuel Company's mines produced 373,700 tons of coal, 290,000 tons of which came from No. 1 shaft, Esplanade and Protection Island Mines, Nanaimo, and 83,700 tons from No. 4 mine, Northfield. The gross output of the coal mines of Vancouver Island was thus 1,163,817 tons.

So active was the demand for locally-made Portland cement during 1906 that the Vancouver Portland Cement Company enlarged its works at Tod Inlet, near

Victoria, Vancouver Island, by one-half, bringing the capacity up to 900 barrels per diem. A further enlargement having been found necessary, more buildings, power plant, grinding machinery and another kiln are being added to the works. Practically all the Portland cement used in the Province last year was manufactured at Tod Inlet, where the company already has storage room for 75,000 barrels and ample shipping facilities for all the cement it will be able to manufacture, even with much enlorged works.

ALGOMA, ONTARIO

Active work is now in progress on the Campbell mine, near Bruce Mines. This property, which was leased from the Copper Mining & Smelting Company of Ontario, Limited, in August last, is owned by Messrs. John McKane, of Tonopah, Nev., "Lucky" Scott, of Pioche, Nev., and Dr. Campbell, of Rossland, B. C., and is considered to be one of the most promising in the district. The vein, which is sixteen and a half feet wide on surface, carried high grade copper ore in good paying quantities. A boiler and hoist have recently been installed and a shaft, now forty feet deep, is being sunk which, it is expected, will strike the vein at a depth of 100 feet. A company is now in process of formation for the purpose of taking over and working the property.

Mr. E. Sjostedt, of the Superior Power & Rolling Mills Corporation, Sault Ste. Marie, visited the Bruce Mines, now being worked by the Copper Mining & Smelting Company of Ontario, Limited, on February 14th. He visited the company's plant and the 400-ton concentrating mill, which he considered they were exceedingly fortunate in finding already built for them on the property when it was taken over from the former owners, The Bruce Mines, Limited, and expressed his surprise at the improvements and additions which had been made on the property since his last visit some seven years ago. Mr. Sjostedt is on a tour of inspection of the various copper properties in Algoma with a view to obtaining information as to the probable amount of ore available for the proposed new smelter at Sault Ste. Marie, Ont.

The Jury Mines, Limited, have recently offered 25,000 shares of their capital to the public at 10c each. Their property is situated a few miles from Dean Lake, and a promising showing of good grade chalcopyritic copper ore is reported. A shaft has already been sunk to a depth of forty-six feet, and another has now been commenced. A shipment of ore has been made to the Blue Island Smelter at Chicago.

Mr. T. Hayes-Sheen, general manager of the Copper Mining & Smelting Company of Ontario, Limited, has left for London, England, to attend the annual general meeting of the company.

COBALT

Cobalt, Feb. 22. 1907.

Coniagas.—Work is being rapidly pushed forward on the Coniagas.

A twelve drill air compressor has been installed and the foundations are being laid for a hundred ton concentrating plant, containing Hancock jigs, Frue Vanners and Wilfley tables; also a Huntington mill. They are also putting up a large sampling plant. This plant is being installed by the Allis-Chalmers-Bullock Company of Montreal, and when completed will be one of the finest in the country.

A new vein of smaltite and native silver has been found on the Victoria Silver Cobalt Mines property. This important discovery was made within six feet of the contact between the diabase and conglomerate. The vein did not show on the surface, and was opened as a test to see if the contact did or did not mean anything. It is now twelve inches wide.

The great confidence that is placed in the future of the camp and the amount of development work already taking place is shown by the large orders of machinery that have been placed. The Rand-Jenckes have installed over 25 plants. The more important are, at the Coniagas, a 12 drill duplex steam compound air compressor and 100 horse-power boiler; at the Colonial, a 12 drill compressor and three 100 horse-power boilers; at the King Edward, a 12 drill compressor and two 100 horse-power boilers (this plant will be ready in about ten days and promises to be one of the finest yet erected); at the Buffalo Mine, a second half of a complete duplex steam compressor; at the Provincial, first half of a six drill duplex steam compressor and an 80 horse-power boiler, also large hoisting engine; Kerr Lake Mining Company, Nancy-Helen, Townsite and Victoria Mines are also having large plants installed by the same company.

The Allis-Chalmers-Bullock people of Montreal are also very busy installing machinery in the camp. Among the more recent installations are the Green-Meehan ten drill compound air compressor and two 100 horse-power boilers; the Right-of-way, ten drill compressor, a large double drum hoist and one 100 horse-power boiler, also a lighting plant; the Temiskaming Mining Company, five drill compressor and large hoisting engines and a direct-connected lighting plant; the Cleveland Cobalt, three large belt-driven air compressors; the McKinley-Darragh a ten drill compressor and two 100 horse-power boilers and lighting plant. This company are also erecting a five stamp mill.

The Portage Bay district is at present attracting a great deal of attention from mining men of Cobalt, and they feel confident that future development will show this to be a district of great richness. Already the present working mines are showing up large veins of ore and gold in quantity is also found on a great many properties. It is expected that during the spring and summer development many more finds will bring this place into importance.

A great many prospectors are already going into the Montreal River district and Temagami Reserve, where the late rich finds have called attention to the widening of the mineral belt, and this part of the camp will share honors in the spring with Larder Lake.

Cobalt Lake Mining Company.—Cobalt Lake is seven-eighths of a mile long and comprises fifty-two acres. It is surrounded by the Nipissing, O'Brien, La Rose, Right-of-way, Trethewey, Coniagas, Buffalo, Silver Queen and McKinley-Darragh mines. It lies at the centre of the geological disturbance and among the greatest producing mines. The Cobalt Lake Mining Company paid the Government one million and eighty thousand dollars for the right to mine underenath the waters of the lake and a strip 33 feet wide on the east shore. Operations, mainly of a prospecting nature, have been carried on for about two months. The largest and richest vein discovered is No. 4, which angles across the 33-foot strip and enters the lake. It is very rich in visible native silver. A development shaft is being sunk and has attained a

depth of about fifteen feet. One hundred and fifty feet to the south, vein No. 5 is being developed by a shaft now down 20 feet. The values, small at the top, constantly increased with depth, until native silver was struck at a depth of about 18 feet. Two hundred and fifty feet north of No. 4 a vein of solid niccolite a foot wide was recently discovered. This is now being prospected. Besides these, there are many veins which enter the lake along the eastern shore, being devlopd by shafts and ttst pits. Fully a third of the shore line yet remains to be stripped.

A group of Toronto capitalists are organizing a company for the purpose of building and operating a plant for concentrating local ores. The concentrator is designed to profitably treat all ores carrying over $110 per ton, and will have a capacity of about 100 tons per day.

For the week ending February 16 the Trethewey mine shipped three cars of ore, aggregating nearly ninety tons. These are the first shipments from that mine for 1907.

The Kerr Lake Crown Reserve Mining Company, which bought its property from the Government for $178,000 and a 10 per cent. royalty, are working a diamond drill on the lake.

The Nova Scotia mine has shiped a car of cobalt ore to Swansea. The mine has shipped silver ore before, but not cobalt.

Prospectors are daily setting out for Larder Lake. Many also are going up the Montreal River.

The buildings in Montreal Cobalt are nearly completed, and the machinery is on the ground. The plant should very shortly be in running order.

The Canadian Mining Journal wishes to thank Mr. H. P. Davis for a very complete and accurate blue-print of the Cobalt district.

PORT ARTHUR DISTRICT

Silver Mountain Mines.—Notwithstanding reports industriously reported to the contrary, (in the East), Mr. Hanson's force of miners are not operating in the silicious or "churty" formation peculiar to the lower hozizons of the argilaceous black slate formation. On the contrary—and as proven conclusively by their rich strike of high grade smelting and milling ore made in their workings on the 14th inst., the prospect for a continuous run of shipping ore of excellent quality—never, even the palmiest days of the "Shuniat Weishu," looked better. As a result of the very pronounced results from recent development at the West End Mine, unusual activity is being displayed in investigating several outlying mines and prospects in this vicity, and, as a matter of fact, a few of those old prospects have changed hands, and other mining organizations, as the "Amalgamated Silver Mining Company," as formed to operate them at an early date. The conditions for economical mining are now much improved, compared with the early nineties—when no roads, either wagon or rail, existed—while the demand for the white metal is also improving.

Gold.—Near the famous Aticokan iron mine, on Sabawa Lake—on the Rosa Blande—some very satisfactory exploratory and experimental mill work was lately conducted—some eighteen tons of ore yielding from off the plate $540 in gold. The No. 1 shaft is down 50 feet.

Aticokan Mine.—Two miles east of the Rosa Blande, on the north bank of the Aticokan River, are located the substantial and commodious camp buildings, stores and mining plant, of the Aticokan Iron Company, and immediately north, in the elevated ridge, running parallel with river and camp, and rising to an elevation of 150 feet above the water, are the practically inexhaustable magnetic iron ore deposits of this company. A spur line of three miles has just been completed from the main line of the Canadian Northern Railway to the mine, where everything is in readiness for regular shipments to their blast furnaces at Port Arthur—now nearing completion.

The Tip Top Copper Mine.—This property is situated within nine miles of Kashabowie station, on the Canadian Northern Railway. It is owned chiefly in Port Arthur. Capt. Dick Candoe, with a force of miners, has been steadily at work here for several seaosns, and as they mine is splendidly equipped with compressor plant, etc., it was no surprise to find many thousand tons of ore in their stock piles. The Tip Top vein is nowhere under 60 feet in width, while in the lower workings its width continues to expand. In addition to its high percentages of copper, the Tip Top is also distinguished as carrying considerable gold. Arrangements are in progress for the erection of a smelter for the reduction of htis ore, either at the mine—on the shores of Round Lake—or at Port Arthur, the head of navigation on Lake Superior, and the question of transportation, etc., in this connection is just now occupying the attention of the owners and the management of the Canadian Northern Railway.

Native Copper.—Some three or four, apparently, rich lodes carrying nuggets, shot and finely disseminated copper in the amygdaloidal trap formations, are about being opened up in Nipigon, Black and Cloud Bays, on the north shore of Lake Superior.

QUEBEC

Summary statement of mineral products:—

These figures are still subject to some corrections, but are practically correct in a general way.

Asbestos.—First-class crude 1,461 tons, value $325,530; second-class crude 2,456 tons, value $320,115; fibre 18,068 tons, value $783,722; paper stock 39,330 tons, value $676,556; total, 61,315 tons, value $2,105,923.

Mica.—Thumb trimmed 210,000 lbs., value $128,000; split 73,000 lbs., value $23,000; rough culled 116 tons, value $18,000.

Chrome Iron.—First crude 731 tons, value $9,542; second crude 4,005 tons, value $33,934; concentrate 4,047 tons, value $46,982; total 8,803 tons, value $90,458.

Iron.—18,331 tons of iron, worth $61,175, have been used in two blast furnaces, having produced 7,851 tons of pig iron, worth $177,643.

Copper Pyrite (Approximately).—40,000 tons, value $200,000.

Ocre.—2,785 tons, value $33,420.

Phosphate.—690 tons, value $4,100.

Felspar.—1,091 tons, value $3,818.

Graphite.—175 tons, value $8,300.

The total value of the mineral output, including the building materials, represent close to five millions and a quarter dollars.

NOVA SCOTIA NOTES

The shipments from the principal collieries for January do not in a majority of cases compare at all favorably with the shipments of the corresponding month of last year.

The Cumberland Railway & Coal Company's shipments were cut nearly in two, or a decrease of some 23,-

000 tons; the Dominion Coal Company's shipments fell off by some 25,000 tons, and the Intercolonial made a small loss of 500 tons. The two companies that made a favorable showing are the Acadia and the Inverness Railway Coal Company, the former making a gain of five and the latter of ten thousand tons. The falling off in the Cumberland Railway Coal Company's shipments is accounted for by the partial stoppage of work, owing to an outburst of damp, which had to be walled off. The Dominion Coal Company's loss is attributable to a lessened demand from the Steel Company.

There were complaints during the month of a shortage of cars. The complaint has become all but chronic.

The Dominion Coal Company will not be in a position to bank much coal this month, as 12,000 tons will be daily required to fill orders. The company intends shortly to open a mine, or perhaps two, on its extensive areas in what is known as the Lingan or Victoria district. It is known that three fine seams exist here. Some urge the company to give the famous, the now historic, Mullin's seam a trial. Others urge that the Victoria seam should be opened, as affording one of the best coals on the Island. Some of the officials have a leaning toward the Lingan seam, which produces a good gas and coking coal. The company was very much hindered in its operations last year through a scarcity of laborers, or, to be more exact, loaders. This year it will, if possible, try to overcome this obstacle. At present a representative is scouring Scotland, and another is off to Italy, in a quest for laborers.

Development work is still being forced at the Allan

On the ground that eighteen inches of the top coal in shafts of the Acadia Coal Company. It will be some time yet before these are large producers.

the seam is of only medium quality, the management of the Inverness Railway Coal Company gave instructions to leave the coal on. The miners claim that the lessened height lessens their pay, and made a demand for an increased rate. This the manager refused. Meantime the miners are working under protest, and will wait till the opening of navigation before pressing their claims.

The union men at Sydney No. 3, the largest colliery of the Nova Scotia Steel & Coal Company, stopped work the beginning of the second week of the month, in an effort to induce some 150 men not in the union to join their ranks. After a couple of days' stoppage they were successful, but the colliery remained idle the whole of the week, as the management were not prepared to start when the men had settled their differences.

The general imprssion is that wintry weather is of benefit to the coal trade. This may be if snow storms are not included. This last January was much more severe than the previous one, and yet the trade did not benefit.

COMPANY REPORTS AND NOTES

NOVA SCOTIA STEEL

At a meeting of directors of this company, held in Montreal on February 17th, the following report to be submitted to shareholders at the annual meeting thereof was duly approved:—

Your directors submit herewith their sixth annual report, with statement of assets and liabilities, and abstract of profit and loss account for the year ended December 31, 1906.

The total volume of business transacted by the company during the past year was considerably larger than that of any previous year, although, owing to the blast furnace at Sydney Mines being out for relining during the months of November and December, the output of pig iron was not very much greater than during the former year. The sales for the year increased $956,000 over the preceding year.

From our steel departemnt we shipped 42,831 tons of finished material, being an increase of practically 50 per cent. over 1905.

The quantity of pig iron sold, however, was very much smaller than the previous year, being 16,872 tons, as against 28,723 tons during 1906, due partly to the fact that a larger proportion of the output of the blast furnace was made into steel, and partly to the furnace being out of blast during November and December.

On December 31 we had orders on our books for 22,000 tons of steel at better prices than prevailed during 1906.

The quantity of coal mined exceeded that of the previous year by 126,172 tons, the company still being the second largest producer in Nova Scotia.

Early in the year we began the driving of submarine slopes for the purpose of reaching and opening up our sea areas in Wabana. Good progress has been made with this work, and the results obtained strengthen the belief of your directors that these submarine areas may prove to be a valuable asset of the company.

Your directors are pleased to report that the profits for the year 1906 were $960,281.03, as compared with $559,906.63 for the preceding year.

The amount to the credit of the profit and loss account on January 1, 1906, was $795,325.03, which, with the profits of the year, make a total of $1,755,606.06 to the credit of this account on December 31, 1906.

The regular dividend of 8 per cent. on the preferred shares has been paid quarterly.

The sum of $101,878.75 has been transferred to the credit of the special reserve fund—of which $75,000 is for general depreciation and renewals, $12,378.75 for blast furnace renewals, being 25 cents per ton on the output of pig iron during the year, and $14,500 for depreciation of the shipping property owned by the company.

During the year this reserve fund was charged with the sum of $29,215.28, being the amount expended in relining the blast furnace, and the further sum of $50,000 was charged against this account to provide against loss which the company may make in connection with its railway to Sunny Brae.

The amount to the credit of this fund is now $650,989.51, as compared with $628,326.04 at the beginning of the year.

The balance carried forward to the credit of profit and loss on the 1st of January, 1907, is $1,180,783.89, as against $795,325.03 on the 1st of January, 1906.

The sum expended on capital account in plant and improvements, in acquiring iron ore areas, submarine coal areas, and real estate at Montreal and elsewhere amounts to $199,256.10.

Your directors have aimed to place the company in a strong financial position before resuming payments of dividends on the common stock. They have also thought it desirable before resuming these dividends that there should be a reasonable certainty of their continuance under normal business conditions. While the profits for the past year, and the amount now at the credit of the profit and loss account seem to warrant the payment of

a dividend for the past year, the directors believe that the interests of the shareholders will be best served by passing it. They have declared a quarterly dividend of one and a half per cent. for the first three months of the year 1907, payable April 15th, to shareholders of record on March 31, 1907.

DOMINION COAL

The Dominion Copper Company's report for a period of 13 months to December 31, 1906, shows that 225,946 tons of ore were treated, from which 4,405,522 pounds of copper were produced, which netted the company $300,000, an average profit of about $28,000 per month. This production was obtained from the operation of the two furnaces which were in the plant at the time the present management took charge.

A despatch from Rossland says:—Two ore shoots of considerable magnitude and of good grade have been located on 800-foot level of White Bear. The management is much pleased over the finds, and feels confident that White Bear has the markings of a valuable mine. Coke is moving more freely, and considerable has been received at Le Roi smelter at Northport. It is expected that Le Roi smelter will resume operations about March 1. At Centre Star new converters and rock-breakers started up on trial run to-day, worked satisfactorily. The breaker has a capacity of 1,000 tons in ten hours, and will break rock at mine instead of doing it at the smelter as heretofore.

Shipments for the week were:—Centre Star, 1,410; Le Roi, 3,150; Le Roi No. 2, 510. Total for week, 5.070, and for year 35,377 tons. At Trail smelter, 4,136 tons received during week.

A considerable enquiry is reported to have sprung up recently for gold properties in the Rainy River district. A fine sample is reported to have been brought from the vicinity of Wabigoon running $20,000 to the ton in gold. In the past the gold ventures in the Rainy River district have not been successful, possibly owing to the expensive plants ordered by developers.

PIG IRON IN CANADA

The production of all kinds of pig iron in Canada in the calendar year 1906 amounted to 541,957 long tons; of which 525,716 tons were made with coke, 16,021 tons with charcoal, and 220 tons with electricity.

The iron made is classed as below:—

	1905.	1906.	Changes.
Foundry and forge...	146,698	130,120	D. 16,578
Bessemer pig	149,203	165,609	I. 16,406
Basic pig	172,102	246,228	I. 74,126
Total	468,003	541,957	I. 73,954

The total increase was 15.8 per cent. Canada has not made spiegeleisen or ferro-manganese since 1899.

On December 31, 1906, Canada had 15 completed blast furnaces, of which 8 were in blast and 7 were idle. Of the total 12 usually use coke for fuel and 3 use charcoal. In addition one furnace, to use coke, was being built and 3 coke furnaces were partly erected on December 31. Work on the partly erected furnaces was, however, suspended some time ago.

During the week ending February 9th, 1907, forty-one companies, twenty-one of which were mining companies were incorporated in Ontario. The total capitalization of the mining companies was $20,635,000; of the industrial companies, $2,755,000.

BOOK REVIEWS

The Cruise of the Neptune—a report on the Dominion Government Expedition to Hudson Bay and the Arctic Islands, on board the D. G. S. Neptune, 1903-1904, by A. P. Low, B.Sc., F.R.G.S., officer in charge. Ottawa—Government Printing Bureau, 1906.

In this substantial volume Mr. Lowe gives a direct, uncolored but vitally interesting account of the voyage of the D. G. S. Neptune.

Commissioned in the summer of 1903, the Neptune left Halifax on August 23rd of that year. After cruising along the shores of Baffin Island, through Hudson Straits and across Hudson Bay to Chesterfield Inlet, the winter was spent in Fullerton Harbor.

During the long winter, a season of confinement and loneliness, when everything depends upon keeping the officers and men cheerful and in normal health, Mr. Low encouraged all to supplement their routine duties by hunting and attending lines of fox-traps. "This proved," he writes, "much better than formal exercise at stated times and the general health remained good throughout thislong period of enforced idleness."

In the course of the succeeding summer's cruise formal possession was taken of Ellesmere Island, in the name of King Edward VII.

The account of the whole voyage is brief and entirely readable. It is followed by an historical summary of Arctic explorations from the voyage of Frobisher to that of Sverdrup.

Then follows an exceedingly graphic account of the manners, customs and moral characteristics of the Eskimos. This section is well worthy of careful perusal.

The geology of the countries touched upon is next developed. Mica mining is being carried on at Lake Harbone, on the north side of Hudson Strait. Referring to the Nastapoka iron deposits, Mr. Low says: "Most of these ores would require separation from the bands and lenses of jasper. The position of the ores on the islands separated from the mainland by a sound varying from a mile to four miles in width, with excellent, almost tideless, harbors, constitutes ideal conditions for shipment." He points out that advantage could be taken of the magnificent water power of Nastapoka River, "which falls 160 feet into the sea within a few miles of the best ore deposits. . ." No coal is found in Hudson Bay, so that economical smelting near the mines cannot be attempted, until electrical smelting becomes practicable.

The chapter on whaling makes stirring reading. That on navigation of Hudson Bay is of definite value. Mr. Low speaks with authority upon this subject. Let us quote him again. "The period of safe navigation for ordinary steamships through Hudson Strait and across Hudson Bay to the Port of Churchill, may be taken to extend from the 20th of July to the 1st of November. This period might be increased without much risk by a week in the beginning of the season and by perhaps two weeks at the close."

The "Cruise of the Neptune" is typographically attractive. The photographic illustrations are well chosen. Mr. Low writes crisply and breezily, and nowhere is the reader burdened with any attempt at decorative descriptions.

Altogether, for profit and pleasure, we heartily recommend the book to our readers.

MEN AND MATTERS

F. J. Pope, a graduate of the Kingston School of Mines, has gone to Chile to examine a mine for the Guggenheim interests.

J. L. Parker, at one time manager of the North Star Mine, East Kootenay, British Columbia, and for the last two years manager for the Brown-Alaska Company of New York, with mines at Hadley, Prince of Wales Island, southeast Alaska, and Portland Canal, British Columbia, has retired from the latter position and opened an office at Seattle, Washington, as a consulting mining engineer.

T. T. Fulton, B.Sc., lately of the laboratory staff of the Dominion Iron & Steel Company, Sydney, has been given charge of the laboratory of the Londonderry Iron & Mining Company. Mr. Fulton assumes his new duties on March 1st.

E. L. Fraleck, M.E., has accepted the position of superintendent of the Cobalt Lake Mining Company, Cobalt, Ont.

During the month of January, 1907, the continuous rod mill of the Dominion Iron & Steel Company, Sydney, N. S., rolled 7,966 gross tons of iron rods. This is the largest tonnage ever rolled in one month by a rod mill of the continuous type.

The equipment of mines in the Cobalt district is proceeding apace, and at nearly all the principal properties machinery is being installed. One manufacturing firm alone reports that since lats spring orders for fifty-six complete plants have been received and filled.

It is questionable whether any mining district in the world can show an achievement equal to Cobalt in the matter of early establishment of mines on a satisfactory dividend-paying basis. To all intents and purposes the camp is barely three years old, yet at least half a dozen mines are now paying handsome profits. Thus: Buffalo is paying dividends at the rate of 12 per cent.; Foster, 36 per cent.; Nipissing, 20 per cent.; Silver Queen, 32 per cent., and recently McKinley-Darragh, 24 per cent. In addition, there are many profit-earning mines owned by individuals and close corporations whose returns are large.

In the House of Commons the other day Dr. Thompson, member for the Yukon, called attention to the possibility of another international difficulty over the Alaskan boundary. The boundary country between the Yukon and Alaska was attracting gold seekers, and should rich strikes be made the uncertainty of the boundary line might cause complications. Dr. Thompson also stated that the boundary between the Yukon and British Columbia was unsettled, and asked the Premier, for a statement on both points. The Premier replied that he had no information at present regarding the British Columbia boundary. The Alaskan boundary had been delimited ten years ago by Mr. Ogilvie, of the Canadian service. The United States had refused to accept this survey, and now a further delimitation was in progress. A curious feature was that so far as the work had gone, it had been found that the Ogilvie line, which the United States refused, was 350 feet too favorable to the American Government. "However," said Sir Wilfrid, "they acted within their rights in refusing it and now another delimitation is in progress."

At a meeting of the Board of Directors of the British Columbia Copper Company, Mr. Colgate Hoyt was elected president, in succession to Mr. F. S. Underwood; Messrs. E. B. Lawrence and F. S. Sumner, vice-presidents, and Mr. R. H. Eggleston, secretary-treasurer of the company. Messrs. E. Hawley, C. A. Starbuck and B. B. Lawrence were elected members of the Executive Committee.

Large additions to the plant of the Ottawa Car Company, Ottawa, Ont., are contemplated. The company is branching out into the construction of steam railway rolling stock.

The Dominion Mining & Smelting Company announce that they are about to start operating their copper smelter at Picton, N. S. They advertise for copper ore.

Early in February J. R. Blackett resigned his position as auditor of the Dominion Coal Company, Glace Bay, N. S. Mr. Blackett had been with the Coal Company since its inception.

Legislative Visit to School of Mining

A notable event has been the visit of the Ontario Legislature to Kingston on Wednesday, February 6th, School of Mining and Agriculture. Some fifty memon the invitation of the Board of Governors of the bers, with Hon. Mr. Mathison, Provincial Treasurer; Hon. Mr. Cochrane, Minister of Lands and Mines; Hon. Mr. Monteith, Minister of Agriculture; Hon. Dr. Willoughby, Hon. Mr. Graham, leader of the Opposition, and Deputy Ministers Thos. W. Gibson and C. C. James, were carried to the old Limestone City by special train, arriving there at 2 p.m. They were received at the station by Hon. Wm. Harty, chairman of the Board; Principal Gordon of Queen's University; Dr. Goodwin, Director of the School of Mining, Mayor Mowat, and others. On the train piloting the visitor were Mr. D. M. McIntyre, vice-chairman of the Board, and Mr. G. Y. Chown, secretary-treasurer.

The visitors were taken in cabs to the Eastern Dairy School, which has done so much for the dairy industry of Eastern Ontario. Thence they were taken to the buildings of the School of Mining, where they were shown laboratories in operation in the various departments, including the mining laboratory, where were seen various products, including corundum, zinc ore—extracted by processes originated there. The long procession then passed through the buildings of Queen's University to Grant Hall, where luncheon was served. This fine audience chamber easily accommodated the 175 who sat down to table with Chancellor Fleming of Queen's University as chairman. At five o'clock the students marched in and filled the gallery. They took charge of the entertainment from that time on.

The toast list brought out speeches from Principal Gordon, the Ministers, and others, in the course of which it transpired that the members of the Legislature had a most friendly feeling towards Queen's University and the School of Mining. The governors of the latter are asking the Government for further aid to provide accommodation and instructors for the large numbers of students now coming in. The Ministers in their speeches referred to this and promised that the Government would give aid, but on the understanding that the friends of the School of Mining and of mining education should come to its help.

The excursionists returned to Toronto at 8 p.m., impressed with the valuable educational work being done in Kingston.

In the annual report of the Canadian Bank of Commerce special reference is made to the improvement in mining conditions in British Columbia, particularly as regards the copper industry. We quote the following excerpt: "The three great mining companies in the Boundary country, working low grade ores under peculiarly favorable conditions as to cost, are now settled factors in the prosperity of British Columbia, and must profit in an unusual degree by the present price of copper. They are making improvements in plant which should bring the smelting capacity up to 6,000 tons of ore daily. At Rossland, in various parts of the Kootenays and on Vancouver Island there has been unusual activity, and while the results in silver and lead mining are not yet what we had hoped, the prospects are better owing to the higher price of both silver and lead and the reduced cost of smelting. There have been important purchases of properties by expert capitalists, properties which have been idle are being worked, and a larger product on a sounder basis than at any time in the past is confidently expected."

Mr. A. D. Madden has been selected as the managing director of the Canadian Central Mines Company, Limited, Cobalt. Mr. Madden has been in Cobalt for over a year in connection with diamond drill operations. He has also had experience in a number of camps, and will take personal charge of the company's property.

A number of eminent geologists and engineers from the United States expect, we understand, to be in attendance at the annual meeting of the Canadian Mining Institute. These include President Van Hise, of Madison University, Prof. Leith, Prof. Kemp, Dr. W. Campbell, Mr. John Birkinbine, and Mr. John Hays Hammond.

COMPANY NOTES

British Columbia.

B. C. Copper.—Mr. F. S. Underwood, president of the British Columbia Copper Company, Limited, issued recently a circular announcing that the Board of Directors had recommended an increase in the authorized capital stock of the company by 200,000 shares of the par value of $5 each, making the total authorized capitad $3,000,000, and to offer at par 116,160 shares or $580,800 of said increase to the shareholders pro rata in proportion to their holdings. The new stock was authorized to stockholders of record of February 20 for subscription to an amount equal to 30 per cent. of their holdings at the rate of $5 per share, of which $2.50 per share is payable March 11th and $2.50 on May 10th next.

Ymir.—A circular has been issued to shareholders, informing them that arrangements have been made whereby the company's indebtedness will be discharged and additional working capital provided by an issue of debentures, of which the subscription of £40,000 has been guaranteed.

Ontario.

Nancy Helen Mines Company, Cobalt.—At the annual meeting of this company Messrs. W. R. Smyth, M.P.P., Wm. Black and J. F. Black were respectively re-elected president, vice-president and secretary-treasurer. The reports presented were of a most satisfactory nature. Some work has been done on the 40-acre claim in Bucke township, owned by the company. On the company's mine in the town site of Cobalt work has been and is being steadily continued. A shaft has been sunk 82 feet and three carloads of ore are now awaiting shipment. A plant and equipment is being installed. Several new veins have been discovered on this property quite recently, besides those now being worked.

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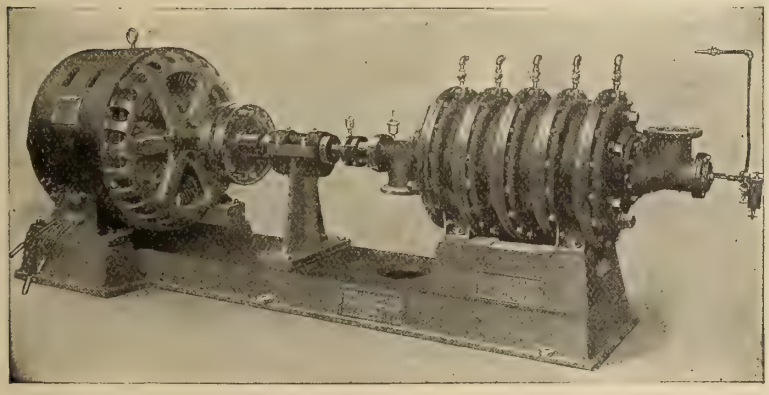
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PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.
Vol. II, 1899, 285 pp., bound red cloth.
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Vol. IV, 1901, 333 pp., bound.
Vol. V, 1902, 700 pp., bound.
Vol. VI, 1903, 520 pp., bound.
Vol. VII, 1904, 530 pp., bound.

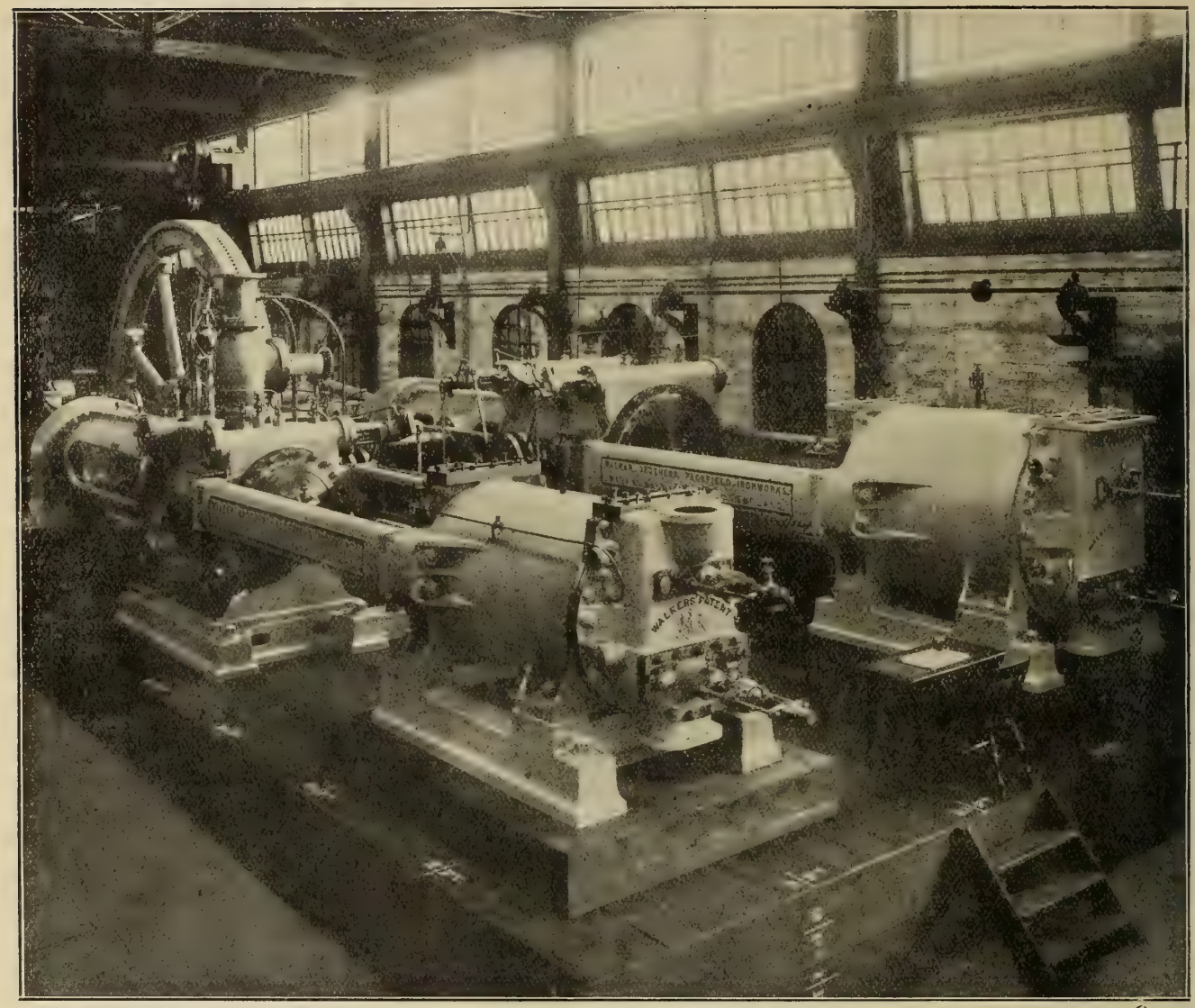
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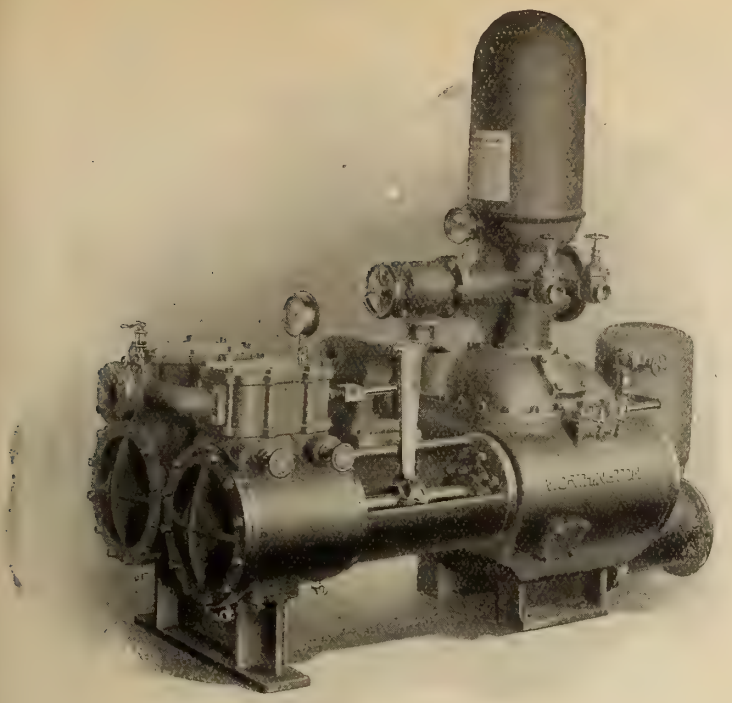
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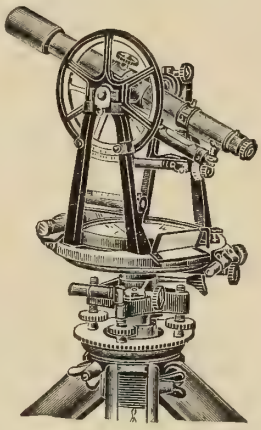
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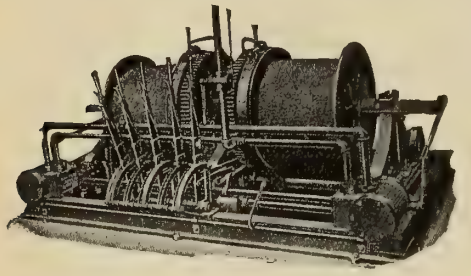
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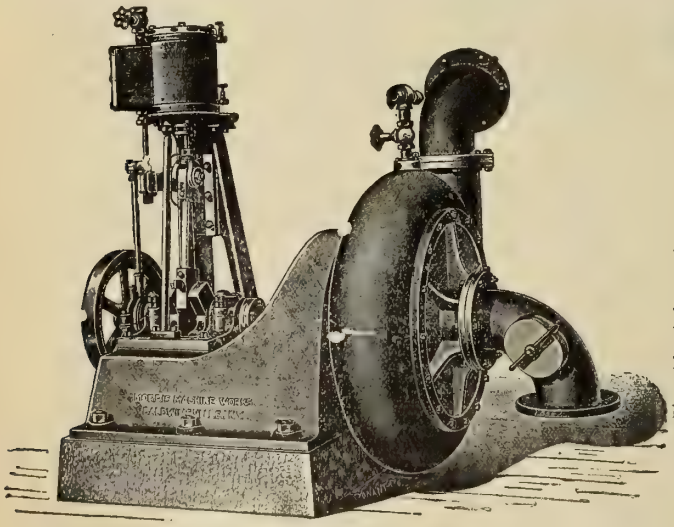
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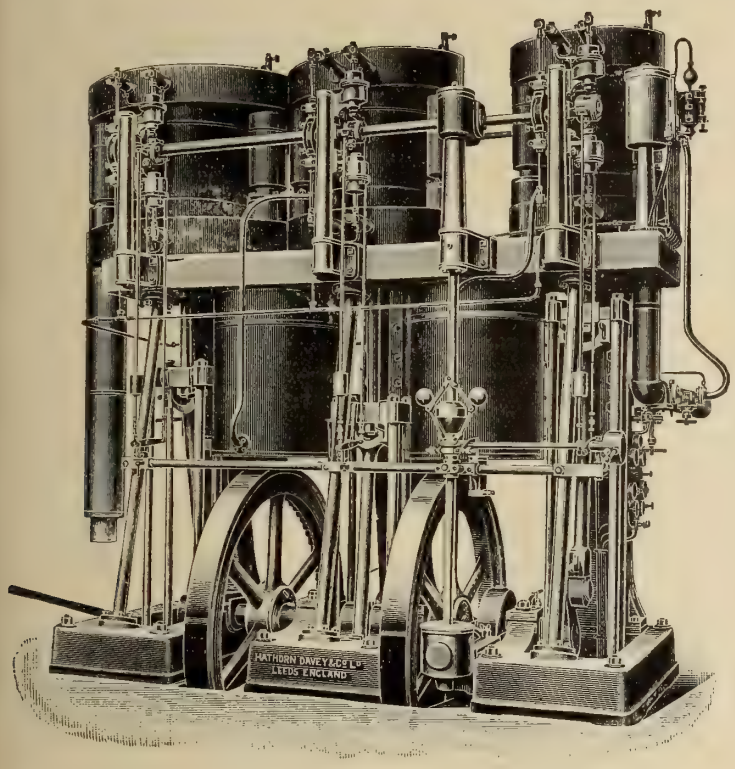
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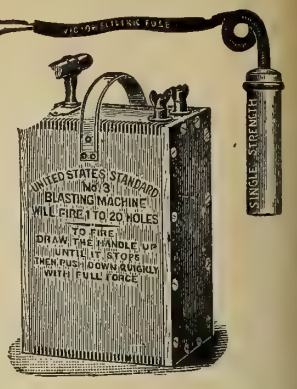
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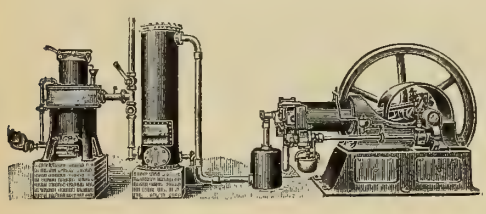
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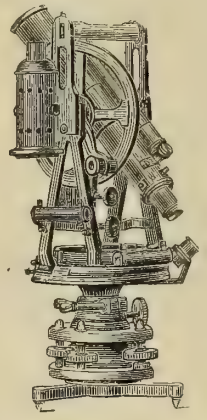
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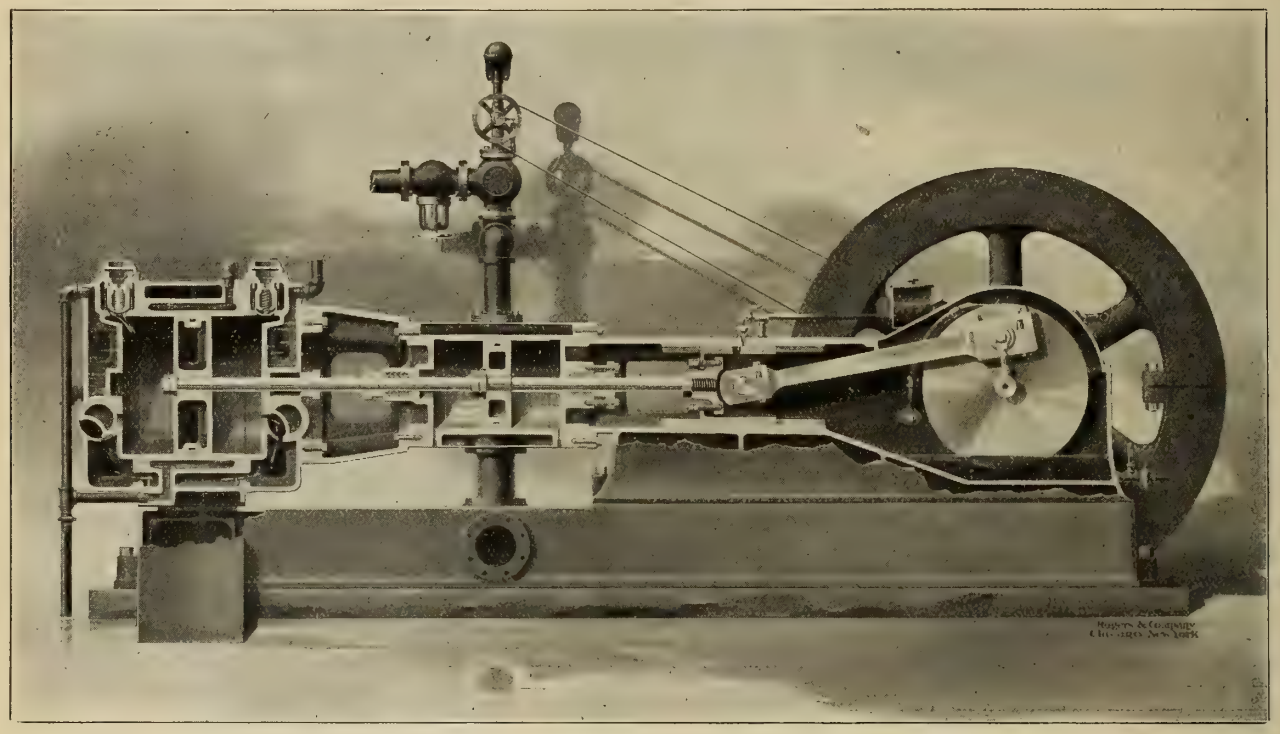
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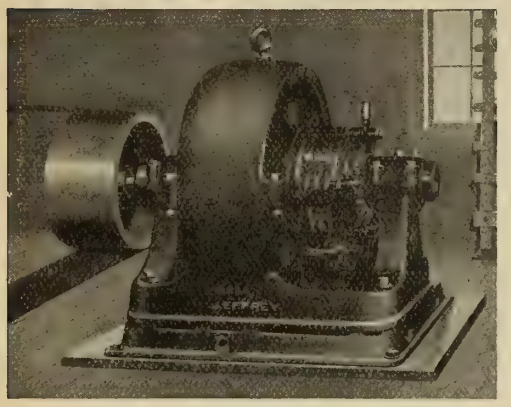
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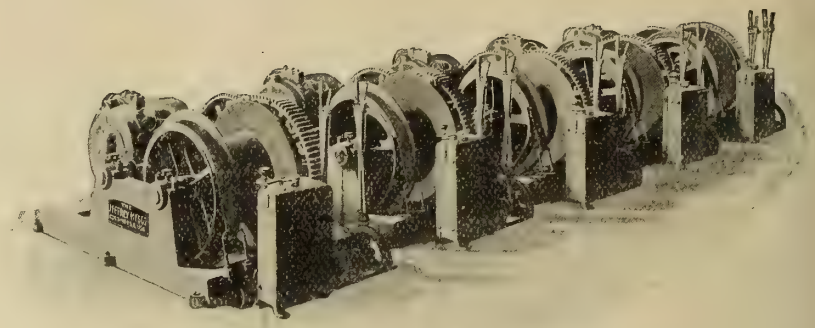
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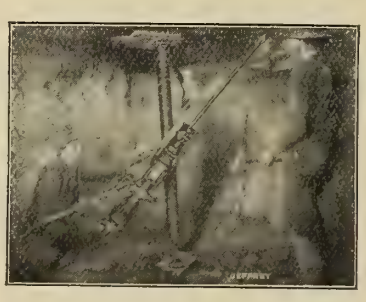
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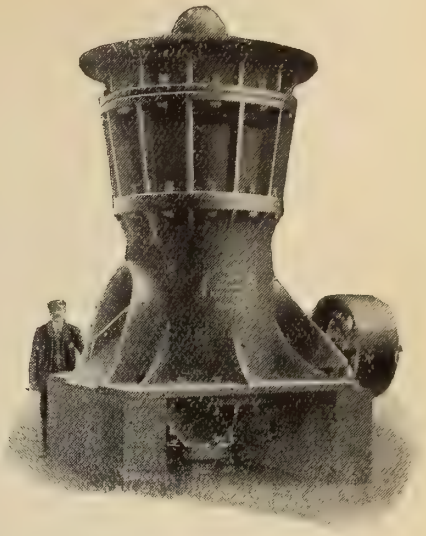
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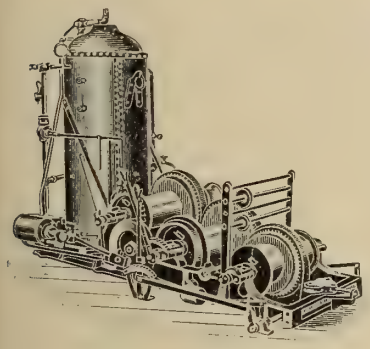
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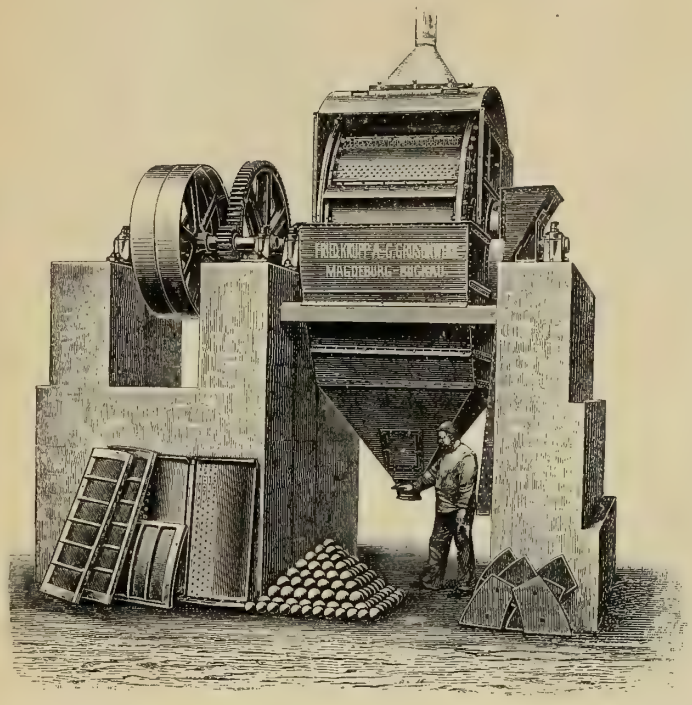
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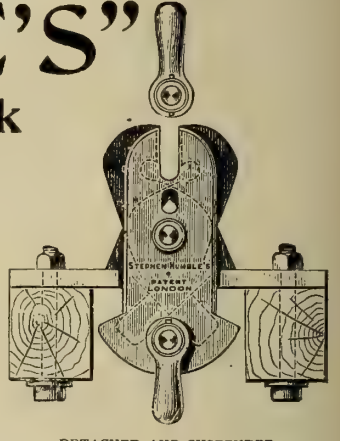
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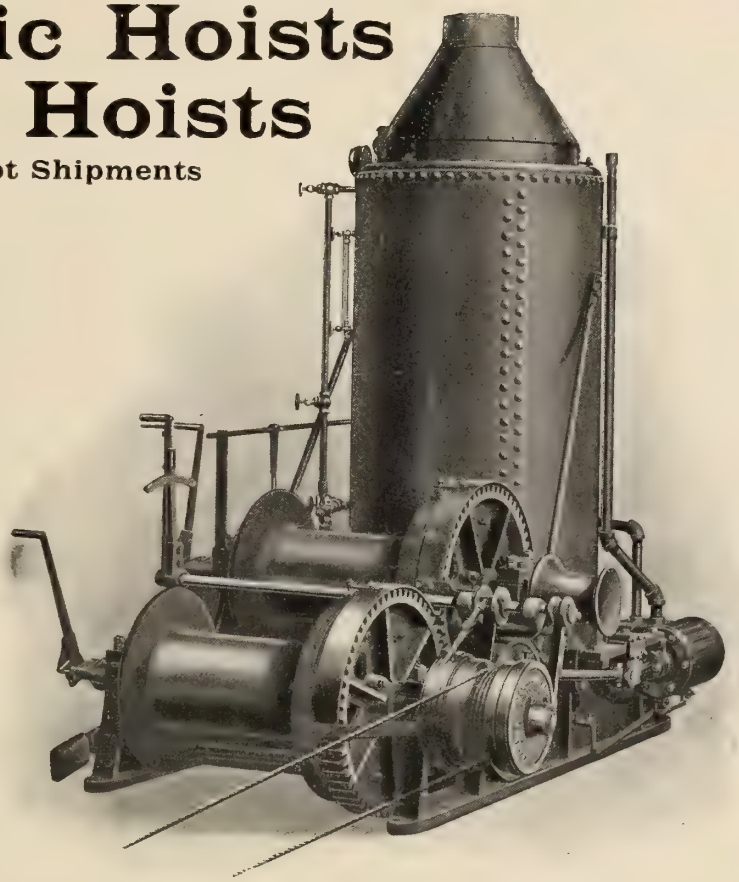
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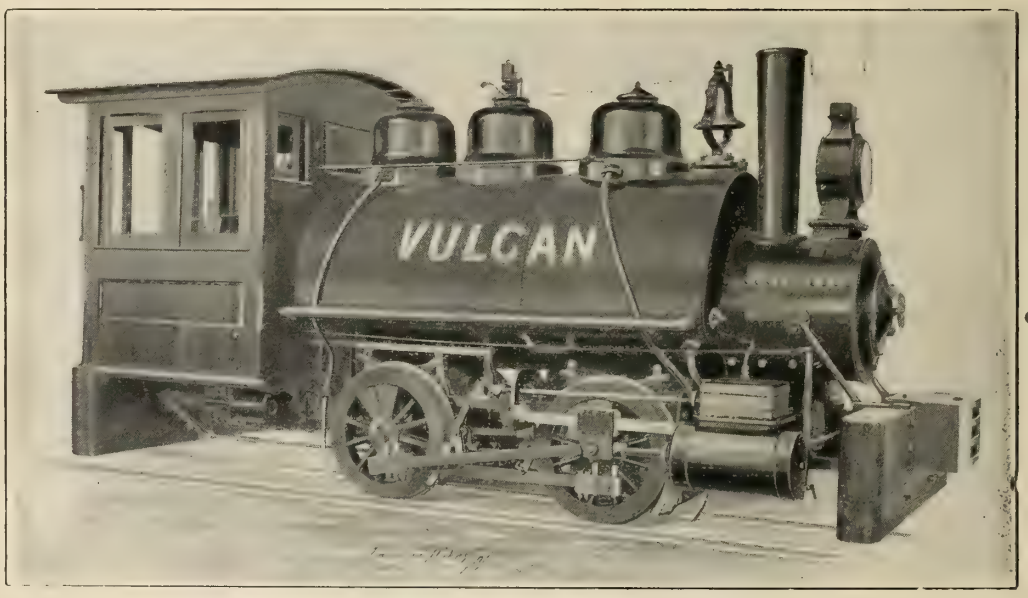
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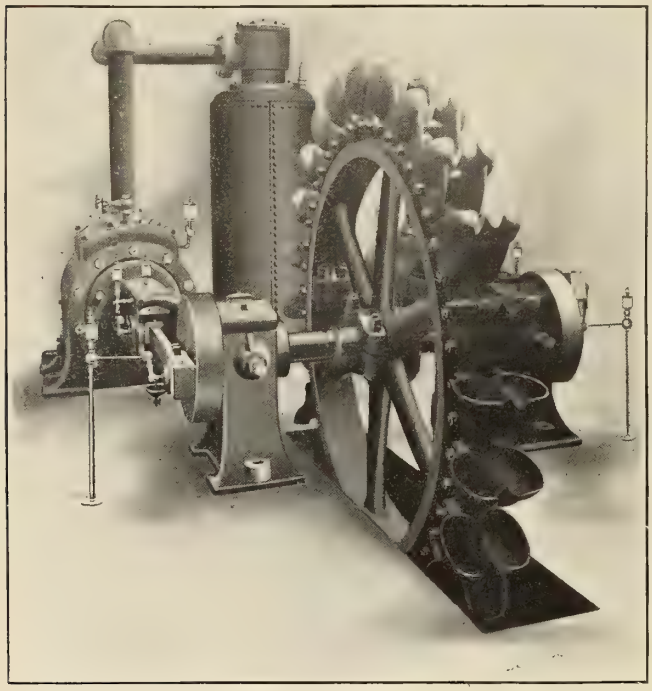
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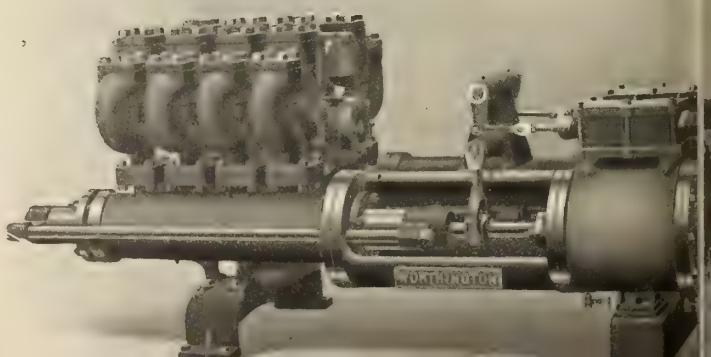
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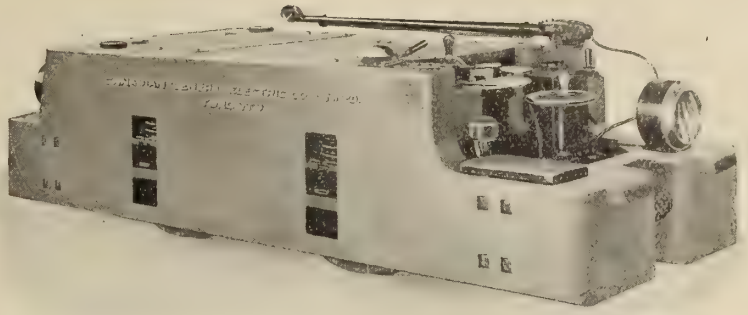
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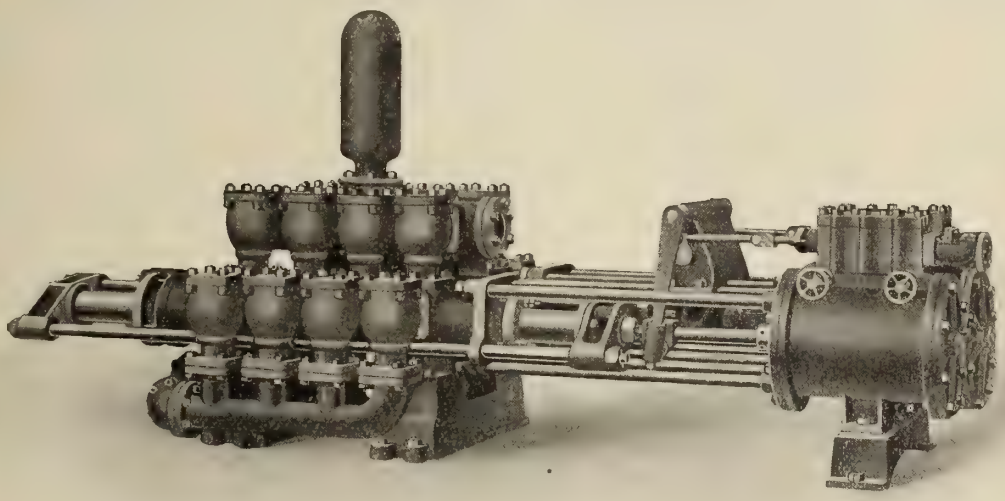
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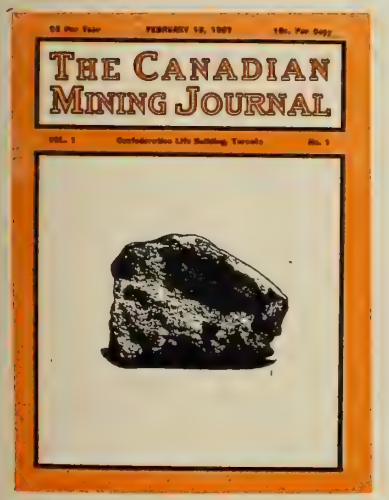
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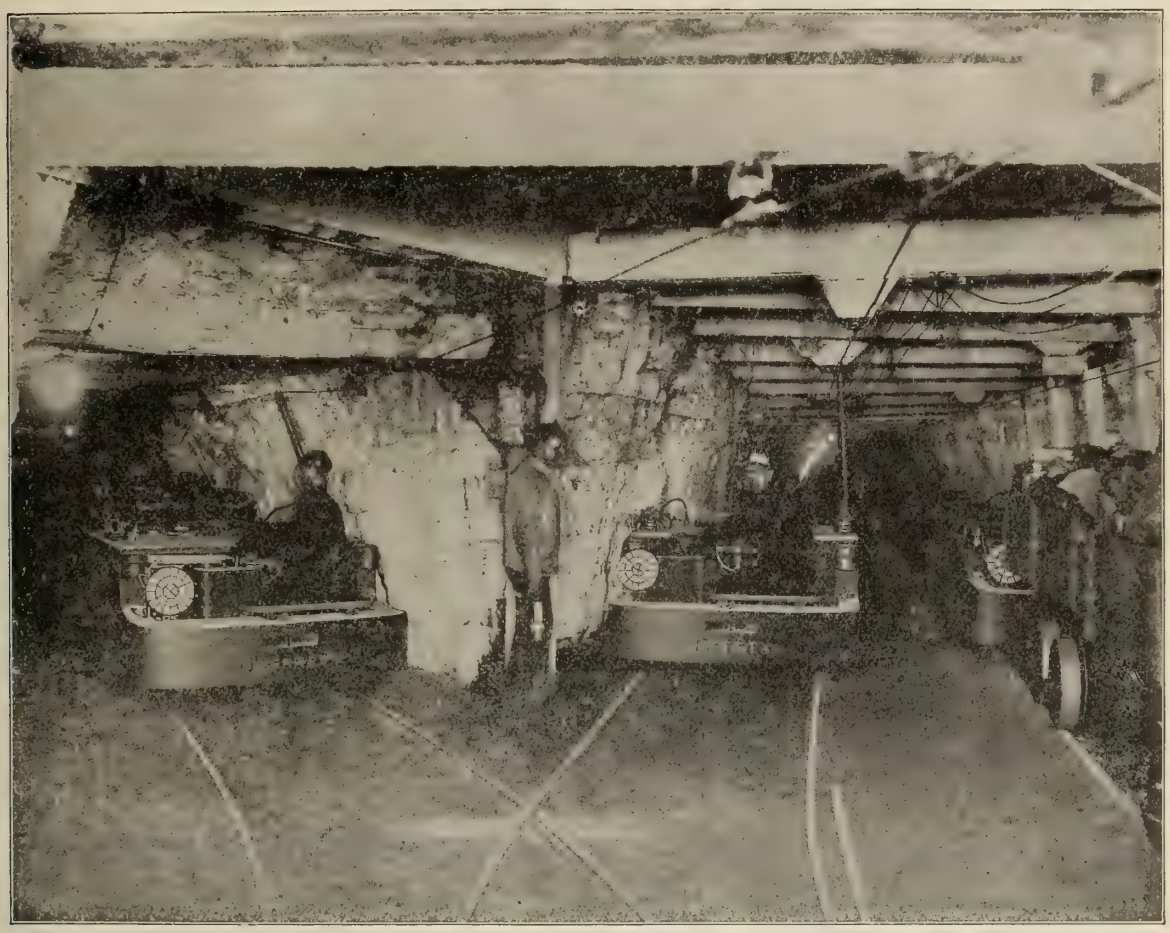
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COAL—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

QUARTZ—A person 18 years of age, or over, having discovered mineral in place, may locate a claim 1,500 x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and in other forms; zincblende, galena, pyrite, mica, graphite, corundum, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The allied metal, cobalt, is also found in Ontario in unsurpassed quantities.

The output of iron, copper, nickel, silver and cobalt in 1906 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

The Canadian Pacific and other railways run through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows :

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre ;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel, and also graphite, asbestos and phosphate of lime ; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions : The full price must be paid in cash ; specimens must be produced and accompanied by an affidavit ; a survey at the cost of the applicant must be made on unsurveyed lands ; work must be bona fide begun within the two years.

Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey, 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines at Quebec, under the direction of the Superintendent of Mines, will give all the information asked for in connection with the mines of the Province of Quebec, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

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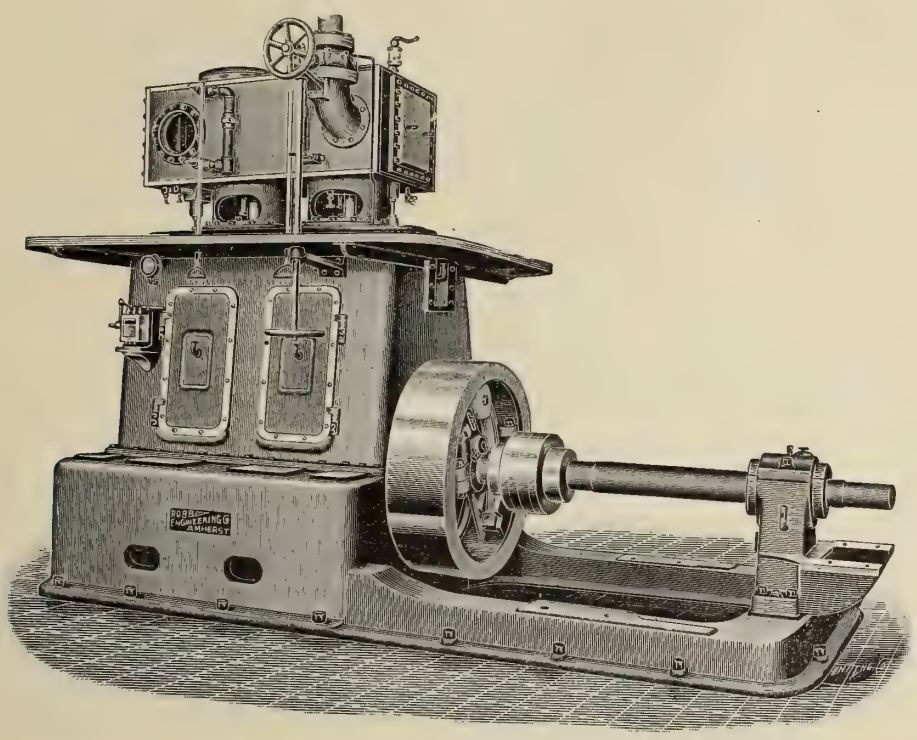
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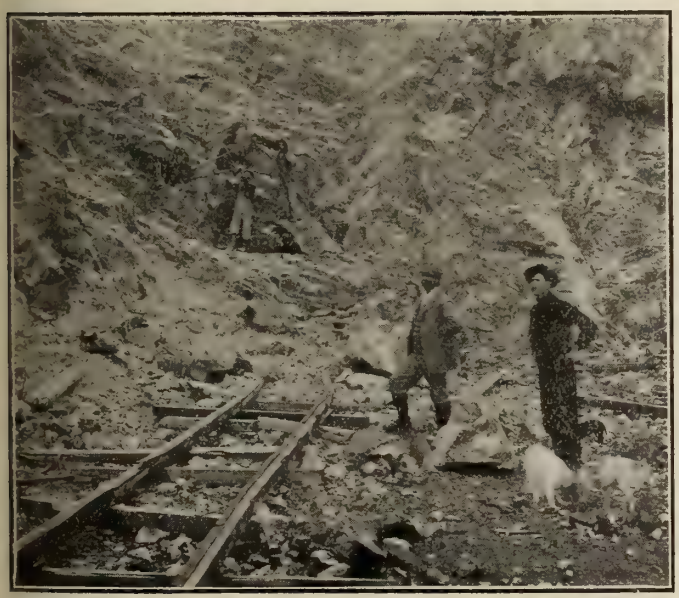
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Particulars of Examinations and copies of the Calendar containing full information may be obtained on application to

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Editors:

J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMB
Sec. Canadian Mining Institute

Business Manager . . . J. J. HARPELL, B.A.
Asst. Bus. Manager . . D. B. GILLIES, B.A.
Circulation Manager . . . A. P. DONNELLY, B.A.

SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario. Dr. J. A. Woodman Dalhouse University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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EDUCATION IN NOVA SCOTIA

We notice with decided pleasure the definite step which Nova Scotia has taken in appropriating a large sum of money for the purpose of establishing an Institute of Technology in Halifax. This institute, however, is to be but one part of the Local Government's plans. To quote from the Halifax Morning Chronicle:—

"The outstanding features of the scheme, which embraces the most complete system of technical education possessed by any Province of the Dominion, or any State of the American Union, are:—

"1.—The establishment of a central institution of university grade in the City of Halifax, to be called the 'Nova Scotia Institute of Technology,' for the purpose of affording instruction and professional training in metallurgical, civil, mining, mechanical, chemical and electrical engineering, and for the purpose of scientific research.

"2.—The establishment of subsidiary technical schools in industrial centres.

"3.—The continuation and enlargement of the Government mining schools, under the director of the Director of Technical Education.

"4.—The appointment of a Director of Technical Education, who will be Principal of the Nova Scotia Institute of Technology, and who will have supervision over the entire system of technical education."

The establishment of subsidiary technical schools appears to the JOURNAL to be a work of supererogation. Nova Scotia already has a good system of high schools and academies. In these students could be prepared for the central institute. Energy will be dissipated and misapplied in duplicating the work of the central institution. Far better were it to concentrate all expenditure and effort upon making the Institute of Technology a credit to the province.

For long Nova Scotia has felt the need of such a foundation. Her young men have been trained for the ministry, for law, and for commerce. She has supplied far more than her quota of eminent politicians and has produced not a few statesmen. Of mariners she has been prolific. Hardly a ship that crosses the Atlantic does not carry a Nova Scotian as captain or mate. But to prepare her sons to develop and conserve her vast mineral wealth she has hitherto done but little.

Dalhousie University, although handicapped by lack of funds and sadly restricted in the matter of accommodation, has, for the past few years, attempted to provide a mining and metallurgical course for a rapidly increasing number of students. Despite adverse conditions, very satisfactory work was done, and is being done.

The overcrowding of the Dalhousie School of Mining, and the plucky manner in which the college staff were attempting to meet the tremendous demands upon their energy, have doubtless been factors in awakening the Government to a proper sense of the country's need. But to the unremitting ardour of the president of the Nova Scotia Mining Society, and to the zeal and enter-

prise of the editor of a weekly paper, is due a large share of the credit in carrying the movement to a successful issue.

ON SAMPLING

It is an axiomatic truth that not one man in one hundred is capable of sampling an ore-body or stock-pile fairly and without prejudice. Although this truth is recognized, it is not acted upon in very many cases. A feeble assent will be accorded it. but sampling is even now largely left to inexperiencde youths. When sampling is done as a step in the mining or metallurgical processes of an operating company, there may be and there often is, gross laxness. When that company is selling a product of mine or smelter, another element is imported into the sampling. It is easily recognized then that loss may follow hard upon the heels of carelessness or ignorance, and errors are guarded against with elaborate pains.

To the lay mind, sampling signifies little beyond securing a "chunk" of ore, or other material, and having it analyzed. But we have seen men of light and learning in technical matters gravely submit a sample, a hand-picked specimen. As, almost invariably, higher results are obtained from the "specimen" than from the legitimate sample, it is obviously a hard task to combat this particular perversion. Even the painstaking labor of an experienced sampler is sometimes vitiated by his personal predilections or prejudices. Suppose that he is sampling a stock-pile, over which there has been a dispute, and that he is one of the disputants, it is harder for a camel to pass through the eye of a needle than for that man to dispossess his mind of all preconceptions. Not a few devices, some of them ingenious and some merely silly, have been suggested with the object of eliminating the personal equation. One expedient, the offspring of a vagarious brain, consists in tearing up a sheet of paper in small pieces and throwing a handfull of these pieces with the wind at intervals over the ground to be sampled. A piece of ore is then taken wherever paper has fallen. One trial of this method is sufficient.

But we wander from our overdue moral. The point which emerges from all this is to this effect, that to fairly qualify as an ore sampler a man must be honest first of all; and that, further, he must be intelligent and observant. Even then he may fail lamentably.

CONCERNING OTTAWA

It is announced from Ottawa that a Deputy Minister is to be appointed to assist the Hon. Mr. Templeman in administering his Department. The office is being created, and its creation will entail a sub-division of responsibility. The Deputy will have control of the Mines Section. The present Department of Mines, and a portion of the Geological Survey, will come under his jurisdiction. The need of such an office is not apparent. But, granting that there be such a need, the selection of a suitable Deputy should be a matter of most careful consideration. Never before has so much depended upon the proper and responsible exploration of our country. Interest in mining and in metallurgical process is at its flood. With the encouragement and with the intelligent assistance from an organized corps of Government geologists, and other specialists, we shall go on from strength to strength. Much, very much, depends upon that help. The efficiency of that help may be destroyed by hasty or ill-considered action on the part of the Government. To state the matter plainly, we strongly urge that, since such a position is to be created, the incumbent be a man, not only of recognized administrative ability, but also of attainment and eminence in the very work which he is to supervise. This is essential. The intrusion of politics in such an appointment as this—a contingency which we hope is indeed remote—would be a lasting blot on the Department's fair name, and a sure precursor of bickerings, strife and incompetency.

LARDER LAKE

At date of writing, more than 3,000 claims have been registered around and about Larder Lake. Company after company is being floated with capitalizations which make one dizzy.

At risk of falling into that obnoxious category of human beings designated "knockers," we wish to express our views. Pick up a prospectus of a Larder Lake company. Read it with care. In almost every case you will see the claim made that fabulously rich assay values have been found close to the property being exploited. In some rare cases these values, it is stated, have actually been found upon the areas of the company whose prospectus you are reading. But it is very generally true that the majority of Larder Lake properties are valuated on an entirely assumptive basis. The district is hardly yet in the initial stage of development. Not until late in April can systematic prospecting be undertaken. And yet thousands of dollars are being invested in possibilities! Improbabilities even are being capitalized at astounding figures!

We have not a word to say against Larder Lake as a legitimate and likely field for prospecting. Of its geological probabilities and limitations we are not now competent to speak. But no camp can survive the reckless and insanely unbusiness-like "boom" to which this place is now being subjected.

We wish to add one word in closing, and it is this. When statements of assay values are quoted in any prospectus, it is safer and saner to ignore them altogether unless signed affidavits describing the exact places, conditions and method of sampling, the name of the sampler, the name of the assayer, the size of sample and the circumstances under which it was shipped can be obtained. This is one very necessary and very much neglected preliminary step. You have, at this point, sufficient information to justify you in making further inquiry. Your next step is to engage a competent consulting mining engineer to go over the property in question and report upon the feasability of beginning mining operations. In brief, there is no reason under the sun why mining should not be approached in the same business-like attitude which is characteristic of the successful merchant.

THE PROSPECTOR AGAIN

Again we sing the Prospector. We, who of late bepraised and applauded him, do now desire to dilate upon his sinister aspects. A knock resounds upon our editorial door. A lean and cheerful individual enters. From his person emanates the fragrance of black rum and of the narcotic plug. From his pocket leaps the specimen, a lump of quartz besprent with gold—gold

glittering and obvious. He relates his tale. The specimen is but a fragment of a mountain of silica and free gold. He convinces us that in this admixture free gold predominates. Animated by a spirit totally contrary to the commercialism of to-day, he tells us that we may purchase a half interest for a paltry sum. We blushingly demur. We cannot rob him thus. He becomes vehement. We demur some more. At last, red and wrathful, emitting many unkind words, he leaves us.

CANADIAN MINING INSTITUTE

The Canadian Mining Institute held its ninth annual meeting at the King Edward Hotel, Toronto, on the transacted, and papers, written by men eminent in their profession, were read and discussed. On the evening of the 7th the annual dinner afforded relaxation. The convention, which was an unqualified success, culminated in a two days' visit to Cobalt.

Not in the papers read, nor in the discussions which followed, nor yet in the dinner, lay the principal value of this meeting; but, rather, in the fact that several hundred keen, observant men from every part of Canada were given an opportunity of meeting each other.

A distinguished body of American visitors lent an international tone to the assembly.

The good accomplished by such a meeting is not to be measured. Indirectly, an immense, though indefinite, aggregate of beneficial results may justly be attributed to it. Younger members of the society receive inspiration; older members rub off the encrusting barnacles, and all are brightened and strengthened.

The retiring president, Mr. G. R. Smith, filled the chair with tact and never-flagging enthusiasm.

That careful custodian of the funds, Mr. J. Stevenson Brown, made the most favorable report that the Institute has yet received.

The Institute is deeply indebted to both of these gentlemen, as it likewise is to Mr. H. Mortimer-Lamb, the secretary, who wrought diligently to make the pro- 6th, 7th and 8th of March. For three days business was ceedings a success. Mr. Lamb also was responsible for the very dainty menu card.

POSTAL REGULATIONS

The postal treaty between Canada and the United States expires on May 7th next. It has been proposed that the Canadian Government increase the rate of postage on American periodicals to such an extent as to practically exclude certain classes of journals altogether.

The Canadian Mining Journal has no objection to present against a policy which would tend to diminish the overwhelming flood of obnoxious "literature" with which we are being swamped nowadays. But against any measure which would in any way injure or handicap the circulation in Canada of reputable American technical and scientific periodicals, we must register our unqualified dissent. There is ample room for all such journals. The scope for effort and development in Canada, in matters technical and scientific, is ample. Canada's needs are various. It were both shortsighted and ungenerous to place restrictions upon publications whose missions are the dissemination of knowledge and the fostering and advancement of our most important industries.

EDITORIAL NOTES

Some weeks ago, too late for insertion in the last number, the Journal received an entertaining letter from Dr. A. E. Barlow. Dr. Barlow wrote from Liverpool, in the best of spirits and healt. We are sorry the limitations of space will not permit us to publish excerpts from the letter, one part of which contained a very refreshing description of a winter voyage across the Atlantic.

The Premier of British Columbia in a recent speech asserted that more progress had been made in the development of metalliferous mines during the last year than in any three previous years combined. This fact he attributed to the policy of his Government in introducing no legislation to disturb existing conditions, and he stated emphatically that this policy would be pursued.

An Order-in-Council bearing upon the oil and coal territories of Southeast Kootenay, passed in 1904, declared coal and oil licenses to be issued at the risk of the applicant.

This resulted in confusion and litigation. The British Columbia Government is now introducing an act to rectify matters.

In February's *Labor Gazette* almost all mining districts are reported as active or busy. Edmonton, Alta., Nelson and Nanaimo, B.C., are classed as "very busy." Among the changes in wages and hours recorded is the grant of a bonus of ten per cent. on the gross earnings of its employees by the Western Fuel Company of Nanaimo. The grant is contingent upon the continuance of present conditions in the coal trade. The Wellington Coal Company granted an advance of ten per cent. from January 1st.

As a result of changes in wages during the last quarter of 1906, 1,129 miners were affected, their total weekly earnings being increased by $1,410. The companies granting these concessions were the Cumberland Railway & Coal Company, Springhill, N.S.; the Thetford Asbestos Mines, Que.; the Imperial Oil Company, of Sarnia, Ont., and the British Columbia Copper Company, of Greenwood, B.C. During the month of January, 1907, fourteen miners were killed and twenty-two

When the new Mines Taxation Act becomes law an added obligation will be imposed upon the Ontario Government. In proportion as any mining district contributs to the revenue of the Province, so should the Government acknowledge its responsibility for the construction of good roads, the enforcement of sanitary arrangements in camps, and the many other duties which are the functions of an enlightened administration.

THE CANADIAN MINING INSTITUTE

INAUGURAL ADDRESS BY PRESIDENT GEORGE R. SMITH

OPENING ADDRESS

President: Gentlemen, just a year ago, in opening the eighth annual meeting of the Canadian Mining Institute, I was at that time afforded the exceptional pleasure of welcoming you to the cradle of Canadian nationality, that ancient capital of an old French Province so justly renowned for its wealth of historical association, and its peculiarly beautiful surroundings.



RETIRING PRESIDENT—GEORGE R. SMITH

To-day it is my privilege to greet you in the magnificent Queen City of the great and wealthy sister Province of Ontario. Last year we peered together through mists of vanishing years into the early days in the history of New France, when the development of mineral wealth in North America by European settlers was aided by the fostering care of that great French Minister, Colbert. To-day we meet in a Province possessing, I believe, the youngest Bureau of Mines of any of the older Provinces of the Confederation, and in which State encouragement and recognition of the mining industry can scarcely be traced back more than fifteen years, as compared with the two and a half centuries which have elapsed since the French Minister of State rendered his powerful patronage to the first practical mining essays in New France. It is said, nevertheless, that as early as 1660 the Jesuit missionaries reported gold having been found on St. Joseph's Island, in Lake Huron, and Mr. Merritt tells us that copper ore was actually worked in this Province in the vicinity of Point of Mines or Mica Bay as early as 1770, an English company having sunk a shaft into a vein, which afterwards decreased, and was abandoned. I am not going into the details of the early operations of the Bruce Mines, or the circumstances which attended the production in 1880 in Leeds county of iron manufactured from ore exploited in that vicinity. For a great number of years the mining development of this Province was extremely intermittent, chiefly owing to the fact that no smelting was carried on here, and that the demand for ore came chiefly from the other side of the international boundary line. Yet, in recent years, the advance of mining operations in Ontario has been little short of marvellous.

Metallic productions alone in Ontario increased from $2,565,286 in 1900 to $5,321,677 in 1904. And from 1904 to 1907 I do not think anyone would dare to predict what they will be, but there is little doubt there will be an increase. The output of silver, cobalt, iron ore, pig iron and steel was given as nil in the report of the Bureau of Mines for 1895, and in 1904 the output of silver was placed at $111,887; of cobalt, $36,620; iron ore, $108,068; pig iron, $1,811,664, and of steel, $1,888,349. The report of your Minister of Mines for 1905 claims that the Sudbury nickel-copper deposit constituted the chief source of the world's supply of nickel. The output of nickel in that year was given as $3,344,409, while the copper contents of the matte amounted to $671,833, and if these products had been computed at the price of refined metals, as is done by many public statisticians, their total value would have been little short of $10,000,000, while employment was furnished in this industry to over 1,000 men.



PRESIDENT—MR. FREDERIK KEFFER, GREENWOOD, B. C.

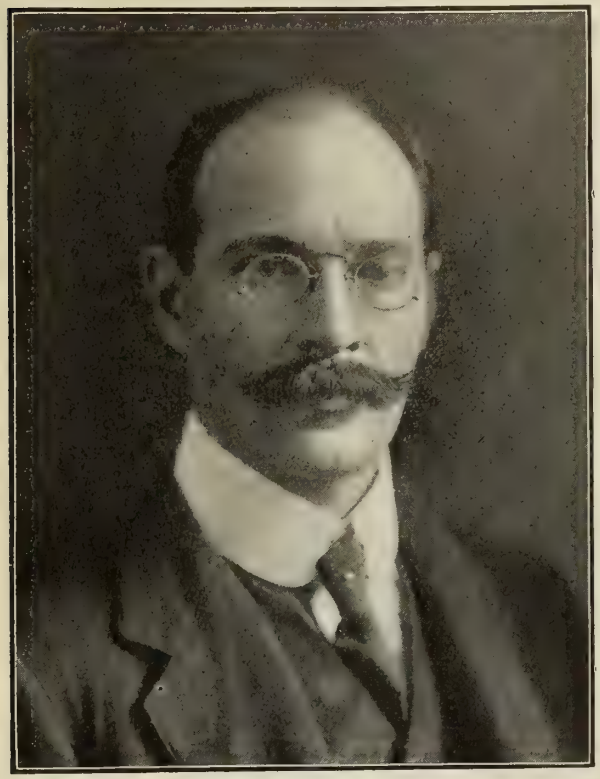
To all these facts and figures, illustrative of the rapid development of your mining industries in recent years, there is yet to be added the marvellous story of Cobalt, which has already proved itself to be the second Klondyke in the world-wide interest which it has aroused. Your Province is also to be congratulated in possessing in the person of your active Minister of Mines, the Hon. Mr. Cochrane, one who has not only taken the keenest interest in the industry, but has also borne in mind in his recent legislation the protection that is due to individual rights. I would not, however, lead you to believe that you hold all the silver and other good things in the country. We, in Quebec, on your eastern boundary, have a great undeveloped mining territory within ten or twenty miles of you in the Temiskaming country. You are more fortunate in your Cobalt district than we in our ore, because of the railway facilities which you have. The railway development gives you direct transportation facilities to the very mouth of your most valuable mines, yet it is only a question of time when we, too, shall have railway communication with the great northern mineral belt of our Province, and communication which, I hope, shall prove valuable to both Provinces.

Last year I remarked on the development in mineral resources that would follow the construction of the Trans-Continental Railway. I am more than ever impressed with the assurance of this fact.

We, in Quebec, are only most anxious to join with you in Ontario, without regard to any political considerations, in assuring the best possible legislation for the interests of the mining industry in general, as well as for those who are practically engaged in it. It is certainly to be hoped that the time is not far distant when we shall have Canadian smelters treating Cana-

dian ores at home, instead of having to ship these latter to the United States for treatment.

The Institute has already proved its efficiency and its ability to largely assist the miner in performing his work and carrying out his ideas generally. I might add that it is only by constant concerted action of this kind that the miner can feel that from Sydney to the

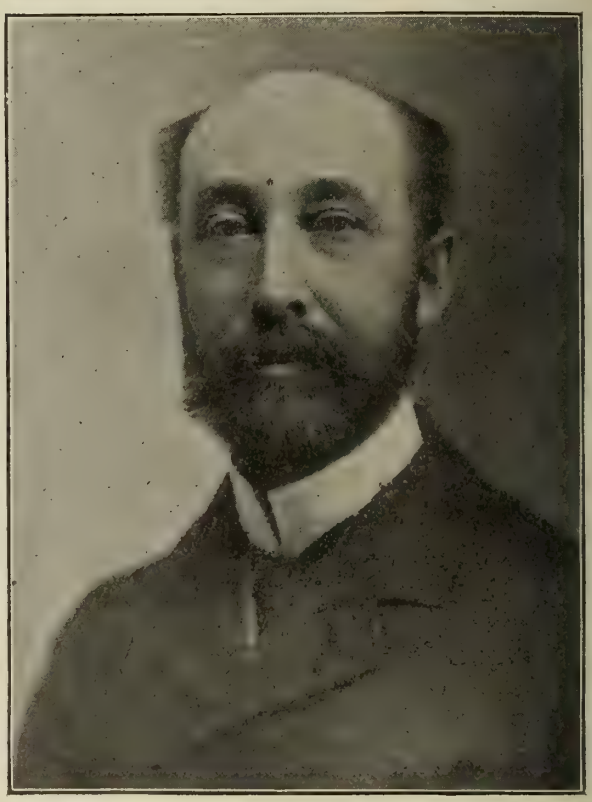


THE SECRETARY—MR. H. MORTIMER-LAMB
Montreal, Que.

Yukon his interests are thoroughly protected, and this unity of purpose and action is bound to secure for the mining men that reasonable legislation which is necessary to the successful carrying out of their work and business. The annual increase in membership shows the popularity of this institution. The modern idea among all professional and scientific classes, civil, mechanical and mining engineers as well, of becoming incorporated for mutual benefit and support, can result only in good. There may be a feeling on the part of some of us that our by-laws, or our methods, or the result of our elections, are not in accord with the ideas of all our members; but our constitution and our by-laws themselves provide any remedy that may be desired in this respect, and after due notice they may be readily amended. Nevertheless, no particular province, nor yet any set of men in the Dominion, should, however, in my opinion, ask for special provisions to meet special circumstances unless with the concerted motion of the whole Institute. It is well that outsiders should know as well as we do that the Institute is not for the benefit of speculators or mining manipulators, but was established, and is maintained, for the advancement and protection of the genuine mining interests all over the country; and, generally to render this work effective and its influence paramount, it is first of all essential, of course, that it should have our loyal adhesion and support as members. Then, while our individual operations, and even the industry as a whole, may have their respective ups and downs, the Institute, I trust—like Tennyson's Brook—will flow on for ever; and, although Cobalt, contrary to every indication, should see its failure, as Port Arthur did some twenty years ago, the Mining Institute would continue its useful career for future generations of mining men.

Gentlemen, it is scarcely possible to declare that the present meeting in this hotel is opened without a passing reference to the unfortunate circumstances attending our former meeting here. There can be no doubt whatever that the regretted death of our late esteemed secretary—Mr. B. T. A. Bell—upon the very eve of the meeting, placed a damper upon the entire proceedings of the convention of that year, so that it was scarcely possible for the City of Toronto, or the Province of Ontario, of which it is the splendid capital, to have formed from that meeting any fair idea of the importance or the influence of this Institution. We meet again to-day in Toronto, not only as one of the mining centres of the Dominion, but the centre of the Dominion from the mining standpoint.

In declaring this ninth annual meeting of the Canadian Mining Institute open for the despatch of business, it is in no purely formal manner that I express the fervent hope that you are each and all a unit in contributing to its interest and success. The papers that are to be read cannot but prove instructive to every mining man, covering, as they do, everything in our mining interests, from coal to gold. It only remains for me to



THE TREASURER—MR. J. STEVENSON BROWN
Montreal, Que.

thank you, gentlemen, for having honored me with the highest office in your gift, and to ask from you continued confidence and support through the sessions of the present convention.

I believe, gentlemen, in conclusion, that in meeting here in Ontario that there are some vital issues

that keenly interest the gentlemen engaged in the mining industry in this Province. It is the duty of this Institute to do all that they can to assist you, and I believe that we come here prepared as an Institute to take up your grievances—whatever they may be—and do all that we possibly can for the best general good of the Institute first, and your interests in general.



VICE-PRESIDENT—Mr. J. BONSALL PORTER,
Professor of Mining, McGill College, Montreal.



VICE-PRESIDENT—Mr. W. FLEET ROBERTSON
Prov. Mineralogist of British Columbia, Victoria.



VICE-PRESIDENT—Mr. W. G. MILLER,
Provincial Geologist of Ontario, Toronto, Ont.

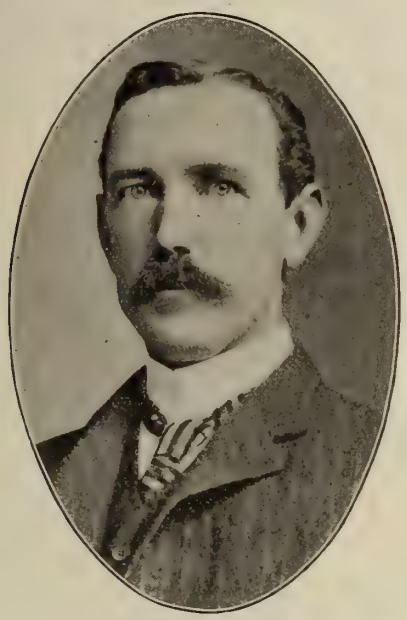
I thank you very much for your kind attention, and, just before starting the regular business of the meeting, I might add that the question of legislation will be taken up this afternoon; the question of legislation as regards the mining tax in Ontario. I hope you will all —those of you particularly interested in it—come here and lend us your best efforts, to see if anything can be done to make the Hon. Minister of Mines see things, if possible, from the mining standpoint, which, we believe, will result in the general good of the Province. (Applause.)

REPORT OF THE COUNCIL FOR THE YEAR 1906-1907

Meetings.

The eighth annual general meeting of the Institute was held at the Chateau Frontenac, in the City of Quebec, on March 7th, 8th and 9th, 1906. The meeting was an unqualified success, and the Council again records its appreciation of the services rendered by Dr. J. Bonsall Porter, to whom, as acting secretary, fell the chief responsibility of organizing and carrying out the arrangements in connection with the proceedings.

During the year meetings of Council were held at headquarters. As provided by par. XXXII. of the by-laws, typewritten copies of the minutes of these meetings have been regularly sent to each individual member of the Council, affording those members residing at a distance and thus precluded from personally



Mr. JAS. McEVOY, Mining Geologist,
Crow's Nest Pass Coal Co., Fernie, B. C.



Dr. FRANK D. ADAMS,
Logan Prof. of Geology, McGill Univ., Montreal.

attending, an opportunity of presenting their views on all matters of business coming before the Council. It is hoped that in future full advantage will be taken of this provision, that the Institute may derive the benefit of the advice and active interest of every member elected to serve on its Council.

Publications.

Thirty-four papers were presented at the Quebec meeting, and these, with the discussions thereon, and a report of the proceedings of the meeting, now form Vol. IX. of the Journal of the Institute, which has been issued to members in good standing.

Membership.

It is gratifying to be able to record an important increase of approximately twenty-five per cent. in the membership during the year, which now, including students, for the first time exceeds five hundred names. This may be regarded as indicative of appreciation and recognition on the part of those engaged in the development of our mineral resources, of the useful work this



Mr. FRANK B. SMITH, Edmonton, Alta.



Mr. R. W. BROCK, Ottawa, Ont.



Mr. J. C. GWILLIM, Kingston, Ont.

Institute is attempting to perform in the interests of mining in the Dominion.

Deputations.

Pursuant to a resolution unanimously passed at the Quebec meeting, requesting the president to appoint a delegation to wait on the Dominion Government and urge the desirability of the early establishment of a Federal Department of Mines, under the direct supervision of a responsible Minister of the Crown, a deputation, of which the following gentlemen were members, Messrs. Smith, Adams, Porter, Drummond and Brown, proceeded to Ottawa on April 18th, and presented the views of the Institute to Sir Wilfrid Laurier and his colleagues, by whom they were most favorably received. Within a few weeks of this interview, the office of Director of the Geological Survey of Canada, which had remained vacant since the death of the late Dr. George Dawson, C.M.G., was filled by the appointment of Mr. A. P. Low, whose interest in that branch of geological science which deals more particularly with the solution of economic problems, is well known. The work of the Survey during the past year, under Mr. Low's direction, has been of an eminently useful and practical character; and the appointment of that gentleman to the head of the Survey is a matter for congratulation on the part of the mining industry in Canada. Following the appointment of Mr. Low to the Directorship, the Survey was disassociated from the Department of the Interior, and placed under the Ministerial charge of the Hon. Mr. Templeman. Although, as yet, the bill for the establishment of a Department of Mines has not been introduced into Parliament, it is understood that such a measure is now under contemplation, and it is hoped, therefore, that before another year shall have passed the wishes of the mining industry in this important respect will have been realized.

Library.

During the year an addition of some fifty volumes was made to the library, and a number of exchanges, including transactions of technical societies, official report and periodicals, covering a period of three years, were bound and added to the shelves. A new catalogue, on the card index system, has also been prepared. The librarian desires to thank in particular the Geological Survey of Canada, the British Columbia Bureau of Mines, the Mining Society of Nova Scotia, the Institution of Mining Engineers and the Mining Institute of Scotland for the donation of valuable early editions required to complete the library sets.

Students' Competitions and Awards.

After receiving the report of the judges, Messrs. Charles B. Goring and Frederick Hobart the Council awarded the president's gold medal, for the best paper submitted by a student member during the year, to Mr. Frank G. Wickware, of McGill University, for his thesis entitled "The British Columbia Copper Company's Mine and Smelters." In commenting on this paper, the judges made the following remark: "We would assign first place to Mr. Frank G. Wickware's paper on account of the comprehensiveness, clearness and ability shown in his descriptive treatment, the good literary style, and the judgment and care shown in arranging and preparing the paper. It is orderly and methodical, well illustrated, representing careful and painstaking work, and appears to us to be worthy of special commendation. A strong point is the inclusion of data in relation to

costs of working, which are a critical point in all mining and beneficiating operations.. It is also to be considered that the paper relates to a Canadian mining enterprise of importance." It may not be inappropriate to add that, in consequence of the general excellence of this paper, Mr. Wickware was offered, and has accepted, the post of assistant editor to so important a technical periodical as *The Engineering Magazine*, of New York and London.

The Council also awarded three cash prizes of $25 each, as follows: To Mr. Frank B. Wickware, for the paper mentioned above; to Mr. J. J. Robertson, School of Mining, Kingston, for his paper entitled "Cyanide Tests on Temiskaming Ores," and to Mr. R. P. Cowen, McGill University, for his paper entitled "Number Four Pit, Brayton Domain Collieries, Cumberland, England."

The Council takes pleasure in congratulating the above gentlemen on the very creditable papers they have presented to the Institute.

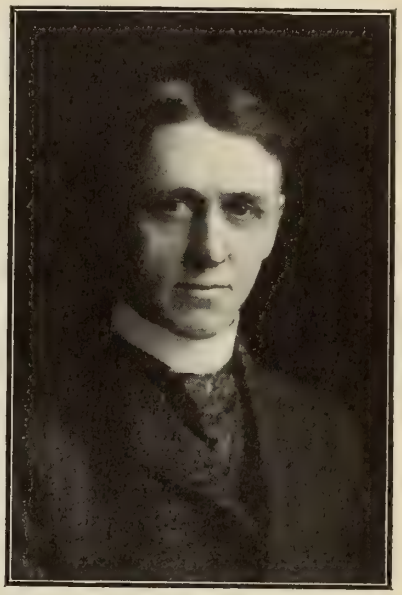
H. MORTIMER-LAMB,
Secretary.



MR. E. W. GILMAN, Montreal.



MR. H. E. T. HAULTAIN, Craigmont, Ont.



MR. DAVID BROWNE, Copper Cliff, Ont.

The ninth annual meeting of the Canadian Mining Institute was formally declared open by the retiring President, Mr. G. R. Smith, on the morning of March 6, at the King Edward Hotel, Toronto.

WEDNESDAY.

During the morning President Smith delivered a forceful address which is reproduced on page 36.

Reports of the treasurer and secretary were read. Both showed a very encouraging condition of affairs. A balance of $1,300 remains to the credit of the Institute after all claims are paid, and an increase of over 20% in the membership was recorded.

MINERAL STATISTICS.

Mr. J. McLeish, of the staff of the Mines Section of the Geological Survey of Canada, presented a statement in detail of mineral production in the Dominion for the past year, the estimated value of which were shown to aggregate over eighty million dollars, or an increase of twelve million dollars as compared with the returns for 1905.

In the discussion that followed Mr. E. Coste pointed out that this increase in twelve months represented rather more than the mineral production of Canada some twenty years ago, at which time he was in charge of the Statistical Department of the Geological Survey.

AMENDMENTS TO THE BY-LAWS.

A number of amendments to the by-laws were then introduced and finally passed, the most important of which provided for the raising of the standard of membership, by creating a new class of associate membership, to which in future those not directly or technically qualified for membership will be admitted. It was also decided to increase the number of council from sixteen to twenty, and a further amendment provided for the abolition of the Nominating Committee, leaving nominations for officers and council to be submitted by individual members.

PROPOSED MINES TAXATION IN ONTARIO.

Mr. J. M. Clarke, K.C., then read a paper on "Mining Royalties," which was productive of an interesting discussion in criticism of the bill recently introduced by the Ontario Government, proposing a tax on mines in that province.

Mr. Clarke pointed out that the bill aimed at taxing mineral areas to which absolute title had previously been granted, and on which the province had pledged itself not to impose royalties.

Mr. Coste added that the incidence of the tax was unjust in many respects, while in the case of the proposed tax on natural gas, the provision for the measurement of gas at the mouth of the well was absurd and impracticable. A Mr. White, representing American capital in Cobalt, having received permission to address the meeting, stated that, in view of the introduction of the measure by the Provincial Government, his principals, who were engaged in legitimate mining and were not company promoters, had decided to withdraw from the field.

It was then moved by Mr. Craig, seconded by Mr. Hardman, and carried, "That the Canadian Mining Institute, in annual meeting assembled, believe that the bill now before the Ontario Legislature, providing for the confiscating of mines, is opposed not only to the mining interests but also to the manufacturing and the agricultural interests of the province, and we as a body respectfully ask the Ontario Government to take time and carefully consider what have been the effects of mining legislation in other countries and in other provinces on such lines as now proposed, before allowing this bil lto become law." On motion it was decided that a deputation of fifty gentlemen representing the Institute should wait on the Hon. F. Cochrane, Minister of Mines, to present the above resolution, and Messrs. Clarke, Leonard, Hardman, Hay and the president were deputed

to address the Minister on the subject of the resolution. The meeting, after some further discussion, adjourned to the Parliament Buildings, where the deputation waited on Mr. Cochrane and his colleagues. The Minister invited a full discussion of the bill, and asked that a committee from the Institute meet again with him on the following Friday afternoon to discuss suggested amendments. This invitation was accepted, and, after seeing Mr. Cochrane on Friday, the committee presented the following report:—

Report of Committee on Mining Taxation.

The committee appointed by the Canadian Mining Institute to interview the Hon. the Minister of Mines concerning the bill for the taxation of mines in the Province of Ontario, met the honourable gentleman on Wednesday afternoon, accompanied by a delegation of fifty members of the Institute. On the invitation of Mr. Cochrane, the committee again met in the Minister of Mines' office on Friday at twelve o'clock. There were present at this interview the Premier, Mr. Whitney, the Provincial Secretary, Mr. Hanna, and the Minister of Mines, Mr. Cochrane.

Many paragraphs and features of the bill, together with the principle of the measure, were discussed, especially the objections which were submitted in a series of resolutions adopted by a full meeting of the Institute on Thursday afternoon and which were immediately transmitted to Mr. Cochrane. While the committee adhered firmly to the resolutions passed by the Institute, yet upon the personal assurance of the Minister that he would modify certain clauses to meet objections, which were stated, and upon his statement that some measure for revenue would have to be enacted at this session, and his further assurance that, as Minister of Mines, he would see to it that the execution of the law should be made as little onerous as possible, that he would be willing to support a new bill drafted to meet the views of the mining community of the province, if the same were prepared within a year, the committee decided to leave the matter in the hands of Mr. Cochrane for this year. They pledged themselves to submit to him within twelve months the draft of a new bill, which would be more acceptable to the mining interests of Ontario. This action was taken in consequence of the personal confidence which the representatives of the mining industry in Ontario have in Mr. Cochrane.

Wednesday Evening.

At 8.30 p.m. Mr. H. H. Stoek, editor of *Mines and Minerals*, of Scranton, Pa., delivered an interesting and instructive address, illustrated by lantern slides, on "Preparation and Mining of Anthracite in Pennsylvania." Mr. Stoek, to whom was accorded a vote of thanks, was followed by Mr. E. Coste, who read a paper on the "New Tilbury Oil Fields."

A very interesting discussion resulted form the reading of a paper by Mr. J. C. Gwillim, of Kingston, on the "Status of the Mining Profession in Canada, in which Dr. Ledoux, Mr. Coste, Dr. Porter, Dr. Goodwin and others took part.

Thursday Morning Session.

A very interesting discussion resulted from the reading of a Miller, Provincial Geologist, in explanation of some additions to the map of Cobalt district. Mr. Miller stated that on the occasion of last annual meeting of the Institute in Toronto, three years ago, the Bureau of Mines displayed for the benefit of the members a fine exhibit of Cobalt ores, but that very little notice was taken of it, and it took the public eighteen months to awaken to the fact that the Cobalt district was worthy of attention. In the meanwhile the profits of mining in this small area had already made millionaires of eight or ten men, while some twenty or thirty others had, by legitimate means, amassed fortunes of from $25,000 to $300,000. Mr. Miller explained that his map of the district had been drawn to on a scale of 400 feet to the inch, and all the known veins had been drawn to scale. He stated that there were roughly a hundred, probably, productive veins in the district, while others were being constantly uncovered.

The Geology of the Cobalt District.

Dr. C. K. Van Hise, president of Wisconsin University, Madison, Wisconsin, then delivered a lengthy and most valuable address on the "Geology of the Cobalt District," of which we print an abstract elsewhere in this issue. The paper was discussed by Mr. Ingall, Mr. Hixon, Mr. Coste, Dr. Bell, Mr. Miller, Mr. Tyrrell, and Mr. Brock. Dr. Bell also read a paper on the Cobalt district, embodying the views contained in his report to the Geological Survey.

In the afternoon Mr. Hiram W. Hixon read a paper on "The Smelting of Cobalt Ores." The following papers were also read: On "The Minerals of Alberta," by Mr. D. B. Dowling; "The Grondal Processes of Concentration," by Mr. P. McN. Bennie; on "Electric Furnaces," by Dr. A. G. Stansfield; "Sir William Logan and the Geological Survey," by Dr. Robt. Bell, and on "Magmatic Waters," by Mr. H. W. Hixon. This last paper created a lively discussion, in which the author found himself pitted in the lists with such doughty scientific champions as Dr. Kemp and Dr. Coleman.

The Annual Dinner.

Members and the guests of the Institute, including His Honor the Lieutenant-Governor of Ontario; the Hon. Frank Cochrane, Minister of Mines; the Hon. Mr. Hanna, Provincial Secretary; the Mayor of Toronto, Dr. Van Hise, Dr. Kemp, Dr. Chamberlain, Dr. Baylie Willis, Dr. Wm. Campbell, and others, assembled in the "Yellow Room" of the King Edward Hotel at 8 p.m., when a short reception was held. Dinner was served in the banquet hall at 8.30, covers being laid for a hundred and thirty.

The table was very tastefully decorated, and the tables arranged to seat parties of six, exclusive of the head table, reserved for the guests of honor, at which the president, Mr. G. R. Smith, presided. Seated on his right was His Honor the Lieutenant-Governor, and on his left the Hon. Frank Cochrane.

The toasts, "The King," and "The President of the United States," having been received with musical honors, the Hon. W. Mortimer Clark, Lieutenant-Governor of the Province, responded in an able and witty speech on behalf of the Dominion and Provincial Governments. The speaker, in passing, stated that he had not had much experience in mining, although he had essayed some experiments, and in consequence had made several very "permanent investments." Mr. Cochrane and Mr. Hanna also responded to the same toast, and the new Canadian National Anthem, the music of which was composed by Dr. Albert Ham, was sung by a trio of professional singers and greatly applauded. "The Mining Industry" was responded to by Mr. J. E. Hardman and Dr. Kemp; "Sister Societies," by Dr. Ledoux, past president of the American Institute of Mining, Mr. R. W. Leonard, representing the Canadian Society of Civil Engineers, and Mr. Corbett, representing the Mining Society of Nova Scotia; "Our Guests," by Dr. Van Hise, Dr. Chamberlain and Dr. Willis; and "The Press," by Mr. Frederick Hobart, associate editor of *The Engineering and Mining Journal* of New York; Mr. H. H. Stoek, editor of *Mines and Minerals*, Scranton, Pa., and Mr. J. C. Murray, editor of The Canadian Mining Journal. At midnight the evening was (officially) brought to a close with the singing of "Auld Lang Syne" and the National Anthem. After which, however, Mr. G. R. Smith gave a lucid and thoughful address on the text, "Why Are We Here." His efforts were ably supported by a distinguished guest of the evening.

Friday Morning Session.

The session opened at 10.30 a.m., when the president announced the result of the election of officers and council for the year 1907, as follows:—

President—Mr. Frederick Keffer, Greenwood, B.C.

Vice-Presidents—Mr. W. G. Miller, Toronto, Ont.; Mr. W. Fleet Robertson, Victoria, B.C.; Dr. J. Bonsall Porter, Montreal.

Secretary—Mr. H. Mortimer-Lamb, Montreal.

Treasurer—Mr. J. Stevenson Brown, Montreal.

Council—Mr. E. W. Gilman, Montreal; Mr. Jas. McEvoy, Fernie, B.C.; Mr. Frank B. Smith, Edmonton, Alta.; Mr. R. W. Brock, Ottawa, Ont.; Mr. J. C. Gwillim, Kingston, Ont.; Dr. F. D. Adams, Montreal; Mr. H. E. T. Haultain, Craigmont, Ont.; Mr. D. H. Browne, Copper Cliff, Ont.

On motion of the secretary, Mr. John A. Dresser, M.A., of Montreal, was elected to fill the vacancy on the council occasioned by the election of Dr. Porter as a vice-president.

The following papers were then read:—

"On the Microscopic Examination of Nickeliferous Pyrrhotite," by Dr. Wm. Campbell, of New York.

"The Marble Bay Copper Deposit, Texada Island, B.C.," by Mr. O. E. Leroy, of Ottawa.

"On the Progress of British Columbia's Mineral Production, 1897-1906," by Mr. G. Jacobs, editor of the *British Columbia Mining Record*, Victoria, B.C.

"The Geology of the Franklin District Ore Deposits, B.C.," by Mr. R. W. Brock, of Kingston, Ont.

AFTERNOON SESSION.

The secretary, having read a letter from the Institution of Mining and Metallurgy, on the subject of standardization, the following committee, Dr. Porter, Mr. Haultain and Mr. Willmott, were appointed to convey the views of the Institute on the subject to the Institution of Mining and Metallurgy.

Dr. Ledoux then gave a short address on the "Richness of Cobalt Ores," which we hope to publish in a future issue.

Papers were read, by Dr. Kemp on "Some New Points in the Geology of Copper Ores," by Wm. Fritz Cirkel on "The Mineral Resources of the Province of Quebec," and by Mr. H. J. Carnegie Williams on "The History of the Bruce Mines, Ontario," and the meeting closed with a vote of thanks to the retiring president.

THE C. M. I.—A BRIEF HISTORICAL SKETCH

BY THE SECRETARY, H. MORTIMER-LAMB.

In writing an account of the history of the Canadian Mining Institute, it is not quite easy to determine where to begin. Officially the Institute, as at present constituted, is nine years old, dating its birth from its incorporation by charter, granted by the Dominion Government in the year 1898. But the germ of the idea was conceived long before then in the active brain of a man, to whose strong personality, energy and public-spiritedness, we as an organization owe so much.

Going back to the old records, we find that no successful effort had been made to secure a general conference of those engaged in mining in the Province of Quebec until 1891, when B. T. A. Bell took the matter in hand and organized the General Mining Association of that province. Again, in 1892, he was the prime mover in the organization of the Mining Society of Nova Scotia, of which he became honorary secretary, and in 1894 he organized the Ontario Mining Society. But Bell was not satisfied with these efforts. He was an ardent champion of national unity, and he found strong support in such men as G. E. Drummond, Hardman, Fergie, and others, in the promotion of his scheme for federating the several provincial organizations and forming one representative body of men engaged in the business of mining in Canada. The plan was first mooted in 1893, and agreed to by the three provincial societies at a united meeting of members at Sydney, Cape Breton, in July, 1894. But it was not until 1896 that the Federated Canadian Mining Institute came into existence, with that staunch veteran, Major R. G. Leckie, who is still the youngest of us all, as the first chairman. The objects of the Federated Institute, as set forth in the constitution, were:

(a) The publication in one volume of the papers and proceedings of the several organizations in the Federation.

(b) Action upon all matters affecting or relating to the mineral industries of Canada.

The Federation continued in existence for two years, serving a useful purpose, but with the growth of the industry it was decided in 1898 that the time was opportune for a re-organization on a more comprehensive scale.

The committee added: "We cannot consider that the Federation has successfully accomplished the purpose of its foundation, in that it has brought together for their mutual benefit the different members of the different provincial organizations, and has created and extended a knowledge of our resources, methods and different personalities. . . Recognizing, however, that Canada is but just beginning her career as a mineral country, and that our position is much more permanent to-day than ever it has been, we cannot be blind to the necessity of providing more funds, for the proper publication of our transactions, than the Federation possesses under its present form of organization."

So the affairs of the Federated Institute were wound up, and from its ashes, Phœnix-like, arose the Canadian Mining Institute, with an initial membership of somewhere in the neighborhood of two hundred representative men. The new charter stated that the association had been founded for the following commendable purposes:—

"First, to promote the arts and sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications. Second, the establishment of a central reference library, and a headquarters for the purpose of this organization. Third, to take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada. Fourth, to encourage and promote these industries by lawful and honorable means."

The record of the work done in the past few years, the high standard of excellence of many of the papers contributed to the transactions of the Institute, and the influence the organization has been able to exert in opposing both Federal and Provincial legislation inimical to the interests of the mining industry, stands for itself.

A word, however, in conclusion, of the men who have helped to make the Institute what it is. After Bell, no one man has worked harder or to better purpose in the interests of the organization than its first president, John E. Hardman. Not only was he during his term of office (1898 and 1899) the ideal presiding officer, impartial, firm, resourceful and eloquent; but for the many years he has served on the council he has ever been ready to sacrifice his private interests to the good of the Society. Whether it was in acting gratuitously as the custodian of the library, serving on committees and deputations, or undertaking secretarial work when it became necessary for some one to act, his services might always be depended on.

But then the Institute has been extraordinarily fortunate in its presidents. I believe it is recorded that Mr. Fergie, during his two years of office, never missed a council meeting, and, when it is remembered that the journey from Nova Scotia to Montreal is somewhere in the vicinity of a thousand miles, this singular instance of devotion and attention to a duty is probably unique. Both Mr. Coste and Mr. G. R. Smith have also done yeoman's service, the former acting as president during a critical time in the history of the Institute when, just before the annual meeting of 1904, Mr. Bell met his death in so tragic a manner. As to Mr. Smith, we have hardly yet accustomed ourselves to regard him in the past tense. He has been the life and soul of the last two annual meetings, and under his presidency the Institute has prospered and grown in influence and usefulness.

The Institute is, meanwhile, to be congratulated in the election of Mr. Frederic Keffer as president for the current year. He is an engineer of very eminent attainments, and enjoys the esteem and respect of all who have the privilege of his acquaintance.

THE GEOLOGY OF THE COBALT DISTRICT

ABSTRACT OF PAPER READ AT MEETING OF CANADIAN MINING INSTITUTE, BY PRESIDENT C. R. VAN HISE, MADISON UNIVERSITY, WISCONSIN.

I had thought of talking, not on the geology of Cobalt, but rather on the ore deposits of that district. The foundations of everything I shall say have been laid by Professor Miller. I myself have learned to appreciate very deeply the accuracy, carefulness, faithfulness and correctness of the geologic work that has been done in the Cobalt area. For many years, however, I have been interested in the general principles concerning the deposition of ores, and from that point of view I have approached this district. What does this district afford in confirmation of any variation from the principles of ore deposition, which have been the subject of study by so many geologists for so many years? This origin, it seems to me, is one which illustrates broadly and well certain principles of two concentrations.

In common with many other geologists, it has been a question with me as to whether or not ore depositions are usually produced by one or two or several concentrations; and very few of the districts which I have visited will exhibit more than one concentration. The history of the ore deposit is not simple, but is usually very complex. One geologist will say that certain ore depositions are produced altogether by magmatic segregation; another, that they are due to ordinary vein action through circulating waters. Others will say that they are due to atmospheric waters.

In almost all cases of dispute, when I have been so fortunate as to go into the district, I have found the story to be a complex one; that each man has had a part of the truth. So these different views are all partial truths.

I have been in Cobalt district only a short time, and could have done nothing, except for the foundation work which I have mentioned; but very early I became convinced that this was an origin in which there had been two periods of concentration—a concentration under deep seismic conditions, free from oxygen, a deep-seated circulation (I know nothing as to whether the waters were atmospheric or magmatic, or partly one and partly the other) in which the oxides and arsenides of cobalt and nickel were deposited in large measure; and that since that time there has been a secondary concentration, which was the result of surface waters descending or travelling laterally, connected in a way with the surface and producing the effect of oxidizing waters. The ore deposits, to be adequately explained, must be the result of this deep-seated circulation producing ores in one form, and of a modifying surface circulation.

The first year I was in the district both Professor Miller and I were inclined to believe that the native silver came in connection with late secondary fracture and surface circulation. It appeared perfectly clear that in many of the veins the cobalt minerals were early products of the deep-seated concentration. Then there was a lateral fracture, followed by the injection of silver-bearing solutions, and as a result of the reducing action of the cobalt minerals the metallic silver was thrown down.

I would by n omeans assert that this is the case with all the metallic minerals. But this suggestion explains many curious things, which you will see when you visit this district. A vein following along the strike shows extraordinary variations in richness, both vertically and laterally. If all the minerals came in at the same time, why should not the silver be somewhat evenly disseminated? When you examine the deposits closely you find that frequently those richer deposits are in places where the veins have been shattered comparatively later, and the silver-bearing solutions have been reduced by contact with the cobalt minerals. This is exactly analogous to the deposition of gold in the San Juan district in Kansas and Southwestern Colorado. Here there were high-grade values at the surface, but deeper the ores became very lean, although the veins were persistent. But in the Smuggler-Union mine, and the Camp Bird, and others, you find a zone of shattering with very rich streaks of gold.

Now the question arises, to what extent are the Cobalt deposits the result of one segregation, and to what extent the result of two?

I am myself, at the present moment, wholly unable to answer that question. It will be one of the problems which the Canadian geologists will work out. But one thing is certain—that those extremely rich superficial depositions of a few feet in thickness, which are connected directly with the weathering, have been produced by two concentrations, one being under deep-seated conditions, when the atmospheric waters were not present, and the other occurring along with erosion. We must remember that in the past these veins went up into the atmosphere to an unknown extent. The veins have been eroded profoundly. Take the veins at the level of ground circulation. In the case of the argentite, it will be oxidized by the atmospheric waters to silver sulphate, which is rapidly soluble. It will be picked up by these waters and carried down into the veins where, coming in contact with the cobalt minerals, the silver will be precipitated in irregular nuggets. Some of these nuggets have reached a depth in the vein. Many have been carried away by subsequent erosion, in fact a vastly greater number than have been found must have been scattered abroad.

Thus this extremely rich upper belt which is so characteristic of Cobalt is unquestionably the result of two concentrations. But most of the mines depend not upon this surperficial zone but upon a horizon which is down below. To what extent has this deeper horizon been the result of a single concentration under deep-seated conditions and, later, of concentration under surface conditions? I am unable to give a definite answer. I am, however, willing to express an opinion. I believe that the secondary concentration, even for this main belt, has had important additions during this secondary concentration. Whether its main richness was thus produced is something for the future to decide.

A very important question now comes up as to the relation of the ores to the diabase. My judgment coincides with that of Professor Miller, that probably the diabase is the source of the ore. The reason for this belief is that those Keewatin and Huronian rocks seem to be in all respects similar to that great double series of formations from Port Arthur to Cobalt. In other words, there are 500 miles of distance through which these Keewatin rocks occur, and conglomerates similar to the Cobalt conglomerates.

Then if the source of the ore was either the conglomerates or the Keewatin, why have not other districts been found in this great area? Doubtless other districts will be found; but this great region has been worked over so thoroughly in such areas as the Lake of the Woods and others, as to make it extremely improbable that the exceptional conditions are associated with the ancient igneous rocks, the ancient floor which was associated with the Huronian conglomerates and slates. Naturally, you associate the exceptional conditions with the sheet of diabase.

But it may be said also, the diabase, as an intrusive rock, occurs all the way from Port Arthur to farther east than this, and is all somewhat similar to this. This is true, but it does not at all follow that when they came up from the reservoirs of this area some exceptional materials were not added. This was true of the Sudbury deposition. There were here exceptional additions after the ignious rocks. And so I believe that the

source of the cobalt nickel and silver mineral is the diabase. How is it that the veins are in the diabase and partly in the diabase and the conglomerate, and also in the Keewatin? Before answering this last question, let us glance at the distribution. Is this diabase a comparatively thin layer separating other layers, or is it great stack that goes down vertically? It seems to me that we have almost conclusive evidence on this point beyond the evidence that Professor Miller has given. If this diabase were a great round mass like this, going down and becoming bigger, then you would have such conditions as you have west of Lake Superior. These layers would be strained and turned back on one another. This is not the case here. There is a gentle series of rolls and folds. There has been no straining. Therefore, Professor Miller must be right in saying that this is a flat sheet. But he has not used the argument, which to me is even more conclusive than the observed facts. It takes hundreds of years for a great sheet like that to come into this region, and that great sheet first cooled along the contacts . While the outer parts solidified, the larger part of the mass was still liquid. Conditions were now favorable for emanations to come from this rock; for fractures to form consequent upon the gentle folding and lifting of the cooling mass. Solutions formed in the cooler parts of the diabase would be set free by these motions, and would carry their cobalt and silver minerals to the fissures and cracks formed by contact with the conglomerate and Keewatin. The fact that the larger mines in the Diabase are close to the conglomerates and slates, confirms this hypothesis. Some mines are farther away; but there is every reason to believe that the diabase did lap over to the west and was eroded away.

What part did the Keewatin play? It seems to me that the Keewatin, with its great abundance of the gangue mineral calcite, which does not occur in the diabase, provided the precipitating agents, and that the source of the ore was the diabase.

If this is true, you have a still further reason for the association of the ore depositions with this wider belt. The men of the district know empirically that they need not go off in the centre of the diabase. They know that the deposits have been found within reasonable distance of the diabase. But the conclusion must not be carried too far. There are possibilities where you find only conglomerate or Keewatin. Diabase may have been there as a capping material and may have been wholly removed by erosion. But where you get all the conditions together, there is the most favorable place to work.

One further point is important. This deep segregation occurred when the diabase was over the rocks. The circulation, the deposition of material was in the conglomerate, in the Keewatin, and in the lower part of the diabase. There may have been depositions over it, but the main depositions were under it. It follows that it is the legitimate task of exploration to follow this horizon of ore-bearing material down under the diabase.

If it does turn out that this is a legitimate horizon for work, then we shall find out what effect the primary concentration and what the secondary has accomplished. What the results of that comparison will be the future only can tell.

Therefore, in conclusion, I may say that I believe the ore depositions of the Cobalt district to have been produced, not by a single concentration, but two concentrations, one of them under deep-seated conditions, the cource of the ore being the diabase, the precipitating agent being probably in the conglomerate. This secondary enrichment has certainly been an important factor in producing such extremely rich superficial films.

It may have been an important factor throughout the entire horizon which is at present being mined. How important a factor it is, it is yet too early to say; but the results adduced, partly from scientific boring, and partly from studying the genesis of the ore, give a rational explanation of the methods of exploration which have been empirically worked out within the Cobalt district.

STATISTICS AND RETURNS

Cobalt shipments for the week ending March 2nd, 1907:—Nipissing shipped 148,470 lbs. to New York. O'Brien shipped 65,500 lbs. to Perth Amboy, N.Y.; 64,630 lbs. to Copper Cliff; 64,480 lbs. to Perth Amboy, N.Y. La Rose shipped 57,480 lbs. to New York. Silver Queen shipped 54,670 lbs. to Copper Cliff. Buffalo shipped 60,000 lbs. to Perth Amboy. Green-Meehan shipped 63,380 lbs. to Copper Cliff.

Mineral production of Ontario for 1906:—

Metallic: Gold, 3,519 ounces, valued at $59,274; silver, 5,357,830 ounces, $3,543,089; cobalt,312 tons, $30,819; nickel, 10,932 tons, $3,836,419; copper, 5,940 tons, $998,548; lead, $93,500; iron ore, 128,099 tons, $301,032; pig iron, 275,558, $4,554,247; zinc ore, 400, $6,000; total, $13,422,928.

Less the value of Ontario iron ore smelted into pig iron (101,569 tons), $243,766. Net metallic production, $13,179,162.

Non-metallic:—Arsenic, 1,298 tons; brick, common, number, 300,000,000, $2,157,000; tile drain, number, 17,700,000, $252,500; brick, pressed, number, 39,860,000, $337,795; brick, paving, number, 3,000,000, $45,000; building and crushed stone, $660,000; calcium carbide, 2,626 tons, $162,780; Portland cement, 1,698,815 barrels, $2,381,014; cement, natural rock, 8,453 barrels, $6,000; corundum, 2,914 tons, $262,448; feldspar, 20,373 tons, $43,849; graphite, 1,772 tons, $15,000; gypsum, 3,265 tons, $6,605; iron pyrites, 11,095 tons, $40,583; lime, 2,885,000 bushels, $496,785; mica, 355 tons, $69,041; natural gas, $533,446; peat fuel, 300 tons, $900; petroleum, 19,928,322 imperial gallons, $761,546; pottery, $65,000; quartz, 3,856 tons, $3,586; salt, 50,414 tons, $367,738; sewer pipe, $365,000; sodalite, 200 cubic feet, $6,000; talc, 1,235 tons, $3,030. Total non-metallic production, $9,042,646; add net metallic do., $13,179,162; total, $22,221,808.

The total combined production for 1905, which was the previous highest record, was $17,854,296.

The output of the mines of Cobalt during the year was as follows:—Silver, 5,357,830 ounces, valued at $3,543,089; cobalt, 312 tons, $30,819; nickel, 156 tons; arsenic, 1,558 tons. Total value, $3,573,908.

Up to the end of 1906 the Cobalt camp produced 8,016,061 ounces of silver, worth $5,015,479, and 446 tons of cobalt, 245 tons of nickel and 1,919 tons of arsenic, valued at $150,779, $13,467 and $3,596 respectively. The last three constituents bring at present little or no return to the mine owners.

Summary of the minera prolduction of Canada in 1906 (subject to revision):—

Metallic:—Copper, 57,029,231 lbs., valued at $10,994,095; gold (Yukon, $5,600,000; all other, $6,423,932), $12,023,932; iron ore (exports), 74,778 tons, valued at $149,177; *pig iron from Canadian ore, 104,660 tons, valued at $1,724,400; lead, 54,200,000 lbs., valued at $3,066,094; nickel, 21,490,955 lbs., valued at $8,948,834; silver, 8,568,655 ounces, valued at $5,723,097; cobalt, zinc and other metallic products, $350,000. Total metallic, $42,979,629.

Non-Metallic:—Asbestos, short tons, 59,283, valued at $1,970,878; asbestic, short tons, 20,127, valued at $17,230; hromite, short tons, 8,750, valued at $92,100; coal, short tons, 9,916,177, valued at $19,945,032; peat, short tons, 250, valued at $750; corundum, short tons, 2,274, valued at $204,973; feldspar, short tons, 15,873, valued at $38,740; graphite, short tons, 447, valued at 18,780; grindstones, short tons, 5,545, valued at $61,624; gypsum, short tons, 417,755, valued at $591,828; limestone for flux in iron furnaces. short tons, 366,015, valued at $268,632; Manganese ore (exports), short tons, 93, valued at $925; mica (exports), short tons, 913, valued at $581,919; mineral pigments: barytes, short tons, 4,000, valued at $12,000, ochres, short tons, 6,837, valued at $36,955; mineral water, valued at $100,000; natural gas, valued at $528,868; petroleum, barrels, 569,753, valued at $761,760; pyrites, tons, 39,611, valued at $157,438; salt, tons, 76,387, valued at $327,150; talc, toss, 1,234, valued at $3,030.

NEW DISCOVERIES IN NORTHERN QUEBEC.

By J. Obalski, M.E., Director of Mines, Quebec.

(Toronto Meeting Canadian Mining Institute, 1907.)

Since last summer a number of prospectors have been in the field exploring the Chibogomo district, the valley of the Bell river, and the north of Pontiac county. In many cases the parties were formed under the auspices of small syndicates, the expense of travelling in these remote regions being considerable. In consequence of these investigations, rather more is now known concerning the mineral potentialities of these areas, and this knowledge is strongly corroborative of the opinions previously expressed by geologists in charge of reconnaissance surveys. The writer last year personally visited the regions between the Hanicanaw River and Lake Abitibi. Below is summarized the more important discoveries made and the geological features in connection therewith.

In the Chibogomo district some work has been done on the big quartz vein of Portage Island, showing the continuity of the vein at depth and its larger mineralization in the form of chalcopyrite. This development includes a number of open cuts on the vein, covering a distance of about 1,000 feet, and the sinking of a shaft to a depth of 35 feet. From tests made, the value in gold and silver appears to be greater than previously supposed. In the northwest section of McKenzie Bay, new discoveries of asbestos are reported, while northwest of Island Bay a large occurrrence of magnetic iron has been discovered. Some large bodies of pyrrhotite carrying high copper values have, moreover, been found northwest of Lake Dore; assays of specimens of this ore have also yielded as high a return as an ounce to the ton.

Northeast of Lake Assinibastot, and southwest of Chibogomo river, cobalt bloom was recently discovered, but too late in the season for the significance of the find to be ascertained. The discovery, however, is seemingly confirmatory of opinions expressed by Mr. A. P. Low and Mr. J. E. Hardman, regarding the similarity of the geological formations here to that of the Cobalt area. It is probable that the district will be well prospected during the coming summer, and other important discoveries will doubtless be made. Meanwhile a good winter trail is now completed from Lake St. John to Chibogomo.

In the north of Pontiac, the writer has explored from the Baie des Guize following the Ottawa and Kinonge rivers, Lake Kewagama, Lake Askikwaj and northward down the Hanicanaw river 20 miles north of the proposed route of the Transcontinental Railway, and thence to Lake Abitibi, White Fish river, and south to the Baie des Guize. Outcrops of Laurentian gneiss occur south of Askikwaj Lake, north of Kewagama Lake, north of Long Bay of Kinonje river, and south of the height of land on the shore of Lake Opasatica. However, the area south of that line is, of course, not all Laurentian, bands of Huronian being found in several places, as shown in Dr. A. E. Barlow's map of 1899. The country crossed by the Transcontinental Railway is covered by a thick layer of clay, but shows in places outcrops of rocks, undoubtedly of Huronian age.

The northeast shore of Lake Kewagama is Huronian, as is, too, the district around Askikwaj lake. Descending the Hanicanaw river the same rocks outcrop for some distance; but further down the surface is covered by clay, with occasional outcrops of rocks. The exposures of rock down the river for the distance travelled of forty miles, and also along the route of the Transcontinental Railway for twenty-five miles, were very few. Nevertheless, the rock in sight is Huronian, being diorite, serpentine, schist, and a granite similar to that found on the height of land, near Lake Opasatica. It is reported that chalcopyrite has been found on the shore of the Hanicanaw river, below the Transcontinental Line.

In the serpentine above mentioned the writer has observed small stringers of asbestos. On the southern slope of the height of land some molybdenite occurs, and it is reported that another deposit has been found in the big peninsula of the Lake Kewagama. In a more westerly direction, the country is rocky and less difficult to prospect, and no important discoveries have been made, except in the vicinity of Opasatica lake. To the northeast of this lake, not far from the height of land, a very remarkable piece of quartz, showing abundant visible coarse gold, was picked up, and exploration since has apparently resulted in the discovery of gold-bearing quartz in place. Two blocks of land have been purchased from the Quebec Government in that section, of which one by the King of the North Gold Mines Company, recently organized to develop the property. The writer visited the district in July last, and, although he did not see any visible gold in the quartz, he obtained good colors by panning the debris in the vicinity of the deposit.

To the south of Lake Abitibi, and close to the shore, a guide of the party found some rock containing gold, and the fact was ascertained that rock of the same character, also showing gold, was here *in situ*.

Some indications of chalcopyrite have also been found close to the boundary line, not far from the 35th mile.

A number of lots have been prospected in the surveyed townships near Temiskaming lake, and a large variety of minerals found there, including galena, iron pyrites, copper pyrites containing some gold, cobalt bloom, and iron; one undertaking, the Jessie Fraser Mining Company, purchased a block of land in Fabre township, on which a small steam plant has been installed. The geological formation of these townships appears to be a succession of bands of Huronian and Laurentian, not yet accurately determined.

On the Bell river some prospecting has been done, but no new discoveries of importance are reported.

Last season the Geological Survey explored from Lake Abitibi Dr. A. E. Barlow also reports on the geology of the eastern part towards the east, following the surveyed lines of the Transcontinental Railway. Mr. W. J. Wilson gives a summary report of this exploration in the last publication of the Geological Survey. the occurrence here of minerals of economic value.

MINING IN THE YUKON

By Dr. Alfred Thompson, *M.P.*

The Yukon Territory has produced in the last ten years, according to official reports, over 120 millions in gold bullion. By far the greater part of this vast amount came rrom what is known as the Klondyke district, and experts who have examined the gravel deposits and measured the yardage, tell us that there still exists about 100 millions in the gravels in this district alone.

Geologists tell us that a very large portion of the Yukon Territory is auriferous, and a comparison of the Klondyke district with the total area of the Territory would be like a postage stamp on an ordinary envelope.

The outpu per year has gradually fallen from twenty-two millions in 1900 to some six millions in 1906. The reason for this gradual decline is because of the great expense in mining the gold by the methods used.

The methods comprise sinking shafts, driving tunnels, thawing of the ground by wood fires or steam, pumping water, etc., and could be only used profitably on the richest ground. As this rich ground became exhausted the output declined, not because the gold was all taken, but because the method of mining made it impossible to work at a profit the lower grade gravels.
and claims that, under the old regime, were almost valueless, have

During the past year a great change has come over the industry, to-day not only a value but a market. This has been brought about by the introduction of outside capital, in the form of dredges, to mine the valleys, and ditches bringing in water, to mine the hills.

Dredging, although only in its infancy in the Yukon, is assuming the proportions of a vast industry, and in a very few years will send the annual output again up to the twenty million mark.

The modern dredge as used in the Yukon is a work of art, and is the legitimate heir of all the improvements in dredging, with a few specialities for the Yukon. It is self-contained, requires only a small amount of water, is driven by electricity, works night and day, and saves a larger percentage of gold than any other method ever used in the Yukon.

These dredges under the most favorable conditions can wash gravel at a cost of from 12 to 15 cents per cubic yard, and, according to the size and number of digging buckets, will handle from 1,000 to 4,000 cubic yards per day of twenty-four hours.

There are ready for work, or in course of construction, seven dredges within a radius of twelve miles of Dawson. In the spring of 1905 there was only one. If all arrive that are ordered, there will be twenty in the same district in 1908, and this is only the beginning of a great fleet of these gold mining leviathans, which will in a few years be overturning the gravels of the famous Klondyke and its tributaries.

Rock mining for silver and copper is becoming an important industry in the southern end of the Territory, and, as far as it is possible to judge, the future of the Yukon is assured.

THE BRUCE MINES, ONTARIO, 1846-1906

By H. J. Carnegie Williams, Bruce Mines, Ont.

(Toronto Meeting Canadian Mining Institute, March, 1907.)

This history of Bruce Mines may, the writer believes, prove of interest, not only on account of the property's value, but because of its comparative antiquity. It is sixty years ago since the original locator, a Mr. Keating, who was connected with H. B. M. Indian Department, was shown by Indians the copper deposits of Copper Bay and Bruce, the latter being so named in honor of Lord Elgin, one of Canada's distinguished Governor-Generals.

In the meantime the Montreal Mining Company had been formed, and an expedition, in charge of Mr. Forrest Sheppard, left Montreal in May, 1846. Mr. Sheppard selected eighteen tracts or locations, each one containing ten square miles. The price paid was, according to Mr. E. B. Borron, £150, Halifax currency, for each location, and 20 cents an acre. On a re-examination of these properties the directors became dissatisfied, and blamed Mr. Sheppard; although, in fairness to him, it should be stated that one of the locations covered the famous Silver Islet.

By the advice of Captain Roberts the Montreal Company purchased the Bruce Mines location for £40,000, Halifax currency, and concentrated all their efforts in opening up the Bruce section on the Cuthbertson location. In 1848 a small party, under Mr. Harris, examined the location adjoining to the west, and known by the name of Huron Copper Bay, on the Keating location. They appear to have done a little work, sinking a shaft within a hundred yards of Lake Hpron. The lode here is small, but of good quality. They also discovered and reported on two other lodes further inland, one of which has been re-discovered this year; whilst another discovery is attracting a great deal of attention on account of the value of the ore disclosed and the width of the vein. It is curious to note that apparently no attention had been paid to these discoveries since 1848.

Meanwhile, in the fall of 1848, the first engine house was erected and machinery installed. Unfortunately, the severity of the climate was not allowed for in the construction of the building, and, in consequence, frost got in the stonework, and when the machinery was set in motion it collapsed.

In this year the late Sir William Logan made a very exhaustive examination, and reported very favorably on the property. In 1849 the small settlement consisted of 77 miners, 65 laborers, 4 boys, 11 blacksmiths, carpenters and other artisans, 2 mining captains, 1 engineer, 2 clerks, and 1 superintendent, giving a population, including the families of the workmen, of about 250 souls. Cholera caused several deaths and delayed the erection of machinery, so that it was not until the summer of 1850 that any returns could be made.

The fact was early appreciated that the keynote of success was the smelting of the ore on the spot, and with this in mind the president of the company, the late Hon. James Ferrier, brought out from Wales a copper refiner and three furnace men. This first attempt, unfortunately, proved a failure, and the smelting works were destroyed by fire. The slag was, in later years, sorted over and the richer portion shipped to England. Assays made by the writer from materials remaining show over 2 per cent. of copper. Ferrier's name is attached to the deepest shaft on this section of the property. The shaft is presumably three hundred feet in depth only, as a record exists of drifting operations east on the lode, in 1868, at the 50 fathom level. (See Plate I showing width of lode at eastern end.)

The dressing operations seem to have been very crude. Cornish rolls, break staff jigs, and concave buddles appear to have been used. Evidently the crushing was not carried far enough, and it is highly probable that they lost three-fifths of the ore contents. At any rate, the results obtained were so different from the estimates, that in 1851 all the officers resigned or were dismissed. In 1852, Mr. E. B. Borron took charge and introduced the tribute system, the men being paid £5 a ton on ore dressed to 15 per cent. and a bonus, varying in price according to market fluctuations, of seven shillings and sixpence per unit. As the ore was dressed to 20 per cent., this would mean £6 17s. 6d. per ton of 21 cwts. A small dividend was declared in 1853, followed by a larger one in 1854. In the latter year the misfortune occurred of the loss of the company's steamer, with nearly all the materials and machinery required for mining and ore dressing operation during the winter. There being no other means of transportation, it was impossible to replace this equipment until the following summer.

In 1854, Mr. Sampson Vivian, having acquired a lease for fourteen years from the Montreal Mining Company, of the western portion of the property, on a royalty of 5 per cent. on the dressed ore, succeeded in forming a company in England, under the auspices of Messrs. John Taylor & Sons. This concern, which was called the West Canada Mining Company, commenced opening out what is known as the Wellington Section; but soon after a teamster, named George Clark, searching for strayed cattle, found a lode, from which the moss and leaves had been burnt off in a recent bush fire, in consequence known as the Fire Lode, which name it still bears. He was rewarded with a barrel of flour. A shaft was started on this new find, and, in digging a water course, another and a wider lode was encountered. On tracing these to the westward it was found that a junction took place on the adjoining Huron Copper Bay location, and Messrs. Taylor & Sons very wisely secured a lease upon this and eventually purchased the whole location, including the Bruce Mines, from the Montreal Mining Company in 1864. It would appear that the Bruce area produced, up to 1857, 3,239 tons of 2,000 pounds, with an average value of 18 per cent. copper, containing 583.22 tons of fine copper.

The capital of the West Canada Mining Company was £200,000, and the cost of installation and development, with all the then

existing difficulties of transport, were so heavy that it was not until 1861 that the mines commenced to pay dividends. Dressing floors were erected on the Wellington and Huron Copper Bay sections; but the buildings not being enclosed, operations were confined to the summer months, the ore being mined and a large proportion left underground during the winter. The following statistics have been kindly placed at my disposal by Dr. Robert Bell, F.R.S., etc.:—

	Tons (2000 lbs.)		Tons fine copper
1858 Bruce & Wellington produced	1266	of 21.94% copper	=277.76
1859 Bruce & Wellington produced	1803	of 21.35% copper	=384.94
1860 Bruce & Wellington produced & Huron Copper Bay....	2411	of 20.50% copper	=494.25
1861 Bruce produced 555			
1861 Wellington do ... .1381	2421	19.60% copper	=474.51
1861 Huron Copper Bay do.. 485			
	7901		1641.46

In 1862 a disastrous bush fire almost wiped out the entire village. The company sent a subscription of £300 to assist those who suffered most, but the men refused to accept anything, and asked to be allowed to devote the money to form a nucleus for a public school fund, which was permitted.

From 1861 to 1868 an era of prosperity set in. The price of copper was good. At first the concentrates were shipped to England, but afterwards to the United States, until the war broke out; when a tax of five cents per pound was put upon copper, thus closing this market.

The average work done during nine years, according to the evidence given by Mr. William Plummer before the Royal Commission in 1890 was "sinking 87 fathoms, driving 113 fathoms and stoping 1,241 fathoms" per annum. This shows very plainly that the stoping ground opened up must have been very wide, taking into consideration the relatively small amount of the development work; in fact, quoting from the evidence of Mr. Frank Prout before the same Commission, "we generally paid about $35 a fathom, the ordinary width being ten or twelve feet; when wider we paid more." Forty dollars per linear fathom, however, was nearer the average price paid, so presumably the lode was over twelve feet wide.

About 350 men and boys were employed, of whom 200 were underground. The cost of superintendence, wages and materials appears to have averaged $12,000 per month. An extraordinary method of working seems to have been adopted, the price for driving a level on contract being $120, the men finding powder, caps, fuse and candles, also steel sharpening, the company doing the mucking and hoisting. Whilst shaft sinking was $240 and stoping $40, but the men were only allowed to do a limited amount of work, so that their average earnings were $40.25 a month. The dollar was calculated on Halifax currency of $4 to the pound sterling.

During the years 1862-1868 the following shipments were made:—

	Tons	Tons (2000 lbs.)		Tons fine copper
1862 Bruce	446			
Wellington 1501		3154	of 19.65% copper	=619.76
Huron Copper Bay 1207				
1863 Bruce				
Wellington		3719	of 20.00% copper	=743.80
Huron Copper Bay				
1864 Bruce				
Wellington		3457	of 19.48% copper	=673.44
Huron Copper Bay				
1865 Bruce (very little from)				
Wellington		3332	of 21.24% copper	=707.71
Huron Copper Bay				
1866 Bruce (very little from)				
Wellington		4157	of 20.00% copper	=831.40
Huron Copper Bay				
1867 Bruce (very little from)				
Wellington		3224	of 20.00% copper	=644.80
Huron Copper Bay				
1868 Wellington				
Huron Copper Bay		3297	of 20.00% copper	=659.40
		24340		4880.31

In 1868 the visit is recorded of Mr. John Taylor, Jr., who made a very full report upon the property, and the following extract sums up the situation at that time in a few words: First, heavy costs of dressing; second, great losses of copper during the process of concentration; third, heavy freight from the mines to England. He made two important recommendations; the smelting of the ore on the spot, and the reduction of the copper by means of salt and iron, known as the Henderson process.

Presumably, after due deliberation, it was resolved to send out, in 1869, Mr. Charles de Bussy to conduct a series of experiments as to the advantages of the Henderson process; and that these were successful is proved by the company erecting, during the years 1870-1871, a plant at a cost of $200,000 (se Plate II, showing all that remains to-day). From the returns it is evident that operations were conducted on a very limited scale during 1872-1873, and were then discontinued. It is stated that the cost of salt, scrap iron and coal was so heavy that the works could not be operated at a profit, although the extraction appears to have been as nearly perfect as possible. The writer has obtained 0.18 per cent of copper as a maximum from the heaps of waste.



PLATE II.—Old Lixiviation Works, Looking North, Bruce Mines, Ont. The Smoke Stack has since been pulled down.



PLATE III.—Sketch of Lixiviation Works, 1871, Bruce Mines, Ont.

During 1868 a certain amount of activity was shown in trying to make fresh discoveries. A shaft was sunk on the north lode, about one mile north of the bruce section, and sunk 75 feet, but work was stopped, it is stated, because the men objected to walk so far to their work, and the shaft house headgear, etc., was destroyed by fire. Nearly equidistant between the Bruce and Wel-

lington sections the lode was found, and a trial shaft sunk 75 feet, then drifted on for 200 feet in each direction, viz., east and west, and a small stope put in on the west drift. Work was stopped here because it was said to cost too much to cart the ore to the dressing floors, not half a mile away; btu the reason is difficult to understand, as the ore is of good quality, and the writer's assays, taken every six feet, will average over 4 per cent. Probably this was considered too poor in those days.

During the years 1896 to 1875 records show that 47,593 tons, of 2,000 lbs., were shipped, with a copper content of 9,562.96 tons, and sold, according to the best authorities, for $3,300,000. The average copper contents were 20.09

What quality of ore was mined must be a matter of conjecture, but it is known that the late owners of the property sold 50,000 tons of tailings, or, as they are locally called, "skimpings," an dthe writer has measured 117,000 tons remaining on the property, whilst a quantity has been washed into the lake, and the Canadian Pacific Railway ballasted their line from here to Sault Ste. Marie, a distance of 36 miles, from the same source. It may fairly be assumed that 400,000 tons of rock were mined, of which 100,000 remain as waste on the dumps, and 300,000 tons probably can be shown as having been treated. With the exception of sinking Bray's or No. 2 Shaft to 420 feet, all this tonnage was won from above the 360 foot level.

If the average value of the ore, after deducting the waste, was four and a half per cent., it should have yielded 13,500 tons of copper, but as only 9,852 tons of copper are shown to have been shipped, it is evident that a loss of 41 per cent. was made in the treatment. Of course, this is merely an hypothesis, but is remarkably close to the estimates of both Messrs. Borron and Plummer, who compute a 40 per cent. loss. It will be noted that there are three epochs of seven years: the first, development; the second, bonanza; the third, gradual diminution for want of development. The debacle came in 1875, but after 1872 no developments were carried on, and presumably the costly experiment of the Henderson process so disheartened the proprietors that orders were given to take everything away worth getting out, at a minimum of cost. The result of this policy can be seen in the "Big Cave" (see Plate IV). Here the junction of the two lodes took place, and the ore must have been surprisingly rich, as it is currently—and the writer believes truthfully—reported that they had at one point 24 feet wide of ore. The greater part, konwn as "prill," was simply put in barrels and shipped. It is satisfactory to say that there is considerable evidence to show that this shoot of ore continues downwards, and the present company will benefit thereby. At any rate, the result of this way of working caused the "Big Cave." A party of six men had been working on a stope from, October, 1874, to March, 1875, and, according to measurement, the record of which exists, they had broken 33 fathoms, 1 foot 3 inches (width unknown, but probably 10 to 12 feet). Following the usual custom, the ore was left underground. Signs of what was coming were frequent, so much so that some men left the mine rather than run the risk. Fortunately for everybody, "the cave" occurred on a Saturday night, so no lives were lost, and the stope, not having been carried below the fifty fathom level, the sixty fathom level remained intact, the only loss being the ore accumulated as above stated. This was virtually the finish, although small parties of tributers worked during 1876. The mine was then closed down for its long sleep until 1898.

The property was in that year secured by some English capitalists, who, after unwatering the shafts, had an examination made by the celebrated mining engineer, Dr. Hatch. The result of this report was so satisfactory, in spite of the fact as above stated, that for three years the mine was literally robbed, that a company was formed in England and work resumed. Unfortunately, like so many other similar enterprises, the cart was put before the horse, a concentrating mill being erected to treat 400 tons a day, whilst underground development was not undertaken on an adequate scale. They, however, succeeded in proving that the lode is no less than 18 feet wide and over 3 per cent. in value, and this at a depth of 420 feet. Then a fire occurred, burning down the newly erected pit head gear, shaft house, with crusher and ore bin, blacksmith's shop, men's dry, power and boiler house, etc. This, naturally, was discouraging, and, occurring as it did during the South African war, the principal shareholders, who were greatly interested in the gold mines of the Transvaal, called the general manager to England, and, not being



Plate IV.—No. 1 Lode. No. 2, or Fire Lode. East End of Big Cave, Bruce Mines, Ont.

satisfied that an output of 400 tons a day could be guaranteed, determined to stop all operations except those necessary to keep the mine dry. Even this they eventually stopped on April 23rd, 1904, and in March, 1905, the writer was commissioned to pump out and make an examination. This was done, and, the report being satisfactory, a company was registered in Ontario, but with English capital, and Wellington and Huron Copper Bay sections have been again unwatered.

The property held by the company consists of the entire mineral

rights over the old original grant of twenty square miles, but only 655 acres of surface rights remain of the former 12,800, of which about 300 form part of the town of Bruce and consist of valuable town sites, docks and water rights. In addition to the 400 ton concentrating mill, there is all the plant and machinery necessary for the mine's development in full working order.

The copper ores, chiefly chalcopyritic, which are found in such abundance, apparently are distributed in well-defined bodies or zones, but, taking into consideration the wide area over which discoveries have been made in this section of the country, and recognizing that these are only a fraction of the whole, it is impossible to deal with this subject within the limits of this paper. Suffice it to say that hardly a township exists without one or more ore bodies, and that it might fairly be stated that in the more settled parts there is hardly a farmer but has some indications of mineral wealth on his property; and it is evident that whatever treatment or process may be generally adopted in the future, it should be one that would enable the smallest as well as the largest producer to participate in, and thus aid in the gradual development of what must prove an immense addition to the mineral wealth of the country. In fact, the company is being constantly urged to erect a smelter sufficiently large to serve the general public in addition to its own requirement, and this should prove a great boon to those in the locality on whose properties are showings of copper.

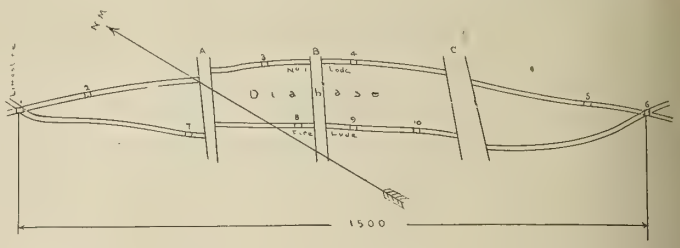
Geology.

The geological sequences from Lake Huron through the Bruce Mines to the north are diabase in the lower slate conglomerate, encircled by dolomitic limestone and followed by the upper slate conglomerate, red quartzite, red jasper conglomerate, with white quartzite forming an anticline, of which the white quartzite is the apex. The lodes have an average strike of 25 degrees W of N., and dip, as a rule, almost vertically to the S.W., until the summit of the anticline is passed, when the dip, if any, is reversed, although there are ore bodies found with an E. and W. strike and dipping S.W. These occur in the upper conglomerate, and appear to be true fissures. All these rocks belong to the Huronian series.

Ore Occurrence.

We have to deal with three classes of ore occurrence. First, in the quartizite, specular iron is often associated with the chalcopyrite, and in places chalcosite is found on the surface. This, on weathering, assumes the appearance of iron, so that the prospector should be warned of the resemblance. The siliceous ores are often accompanied by veins of calcite. Secondly, the fissure veins of the upper conglomerate. Although these were known in the earliest days, they appear to have been disregarded until recently, when a most important discovery was made on this property, and a most interesting one from a mineralogical point of view, as a collection of copper ores might be made from it, both black (melaconite) and red (cuprite) oxides, the latter followed by native copper in leaflets, besides the ordinary bornite, chalcosite and chalcopyrite, with apparently a little pyrrhotite. These can be seen *in situ*, not vertically, as might be expected, but horizontally, the native copper being to the south and followed by the other ores. The only other instance of this order of deposition known to the writer is found at the Spassky Copper Mines in Siberia, where solid chalcosite forms one wall with ore diminishing gradually in value over a width of thirty feet, where it carries only two per cent. As the gangue of these ores carries considerable lime, they would furnish suitable fluxes for the siliceous ores. The third series are the lodes formed in the diabase. A peculiar characteristic of these is that the larger deposits of quartz are found on the sides of what are to-day merely rounded knolls protruding above the ordinary ground level. In many cases glacial action has sheared the crown off, so that almost flat tables are formed, and then the numerous reticulated veinlets are very clearly seen crossing in every direction. (See Plate IV.) At times the larger ore bodies cross one another and form important junctions, although continuing a serpentinous course with little or no alteration of their mineral contents, and yet preserving their average strike.

A typical plan of this occurrence can oe seen on the Wellington



and Huron Copper Bay sections, now being worked by the Copper Mining & Smelting Company of Ontario, Limited.

A. Aphanitic Dyke, 25 feet wide.
B. " 20 "
C. " 40 "
No. 1. Palmer's Shaft, 360 feet deep.
" 2. Bray's or No. 2 Shaft, 450 feet deep.
" 3. Rowe's Shaft, 240 feet deep.
" 4. Mitchell's or No. 3 Shaft, 240 feet deep.
" 5. Scott's or No. 4 Shaft, 340 feet deep.
" 6. Crazie's Shaft, 270 feet deep.
" 7. Unknown. Depth about 75 feet.
" 8. Collin's Shaft, 200 feet deep.
" 9. Gribble's Shaft, 200 feet deep.
" 10. Knight's Shaft, 210 feet deep.

The numerous shafts are relics of the time when hoisting was done by a horse whim.

Dolomitic limestone comes in at the N.W., and the northern portion has not been followed up. That on the south has been explored for 480 feet by an adit parallel to the limestone.

This gigantic horse, 1,500 feet in length, is crossed by three dykes, the material of which differs but slightly from the ordinary country rock. The centre one has not caused any alteration, but the other two are fracture planes, and the entire mass of ground has been forced twenty feet to the north, throwing the lodes accordingly. Whilst at the junction to the west of Palmer's shaft a very rich ore body was found, in parts twenty-four feet wide, to the east, at Crazie's, the junction did not produce anything like such high value, although the quartz is from eight to sixteen feet wide.

The principal ores are chalcopyrite, with a little bornite, and the gangue is highly siliceous. At the surface some very fine deposits of chalcosite were mined, and bornite at the 270 foot and 360 foot levels is again coming in. A typical analysis of poor ore shows:—

Silica	91%
Iron	4.35%
Gold	.01 oz.
Silver	.80 oz.
Copper	2.21%
Lime	.70%
Sulphur	Not stated.

The average run of the mine is three and one-half per cent., whilst the known extent of the lodes is 8,000 feet longitudinally.

Treatment of Ore.

After being crushed to pass a two and one-half inch ring, the ore was fed to 24 inch rolls, from which it was elevated to sizing trommels, the oversize coming back for re-crushing, the finer feeding direct into the jigs. The waste from two series of jigs was again brought back for crushing, whilst the finer stuff went into spitzkasten and fed on to six foot Frue vanners, the waste from the second series of jigs being taken to a six foot Bryan mill and a 30 inch fine crushing roll. The resultant product was lifted by bucket elevators and fed to Linkenbach double-deck tables, 16 feet in diameter. Eventually these finer slimes were put

over another series of Frue vanners. This process of fine crushing appears somewhat complicated, but the idea was to crush very fine to make a high concentrate. They succeeded in obtaining 25.15 per cent., whilst the tailings went 0.53 per cent. (See Plate VII. of mill.)

Having obtained the concentrates, it was necessary to find a market for them, and this meant heavy freight and smelter charges. Therefore it is quite apparent that if blister copper could be produced the bulk of the ore, not only of this property but of the neighborhood, could be cheaply smelted, as they do not contain anything deleterious in the shape of zinc, arsenic, etc.

In order to do this a customs smelter should be built, so that the siliceous ores of our property might be mixed with the ores containing lime and iron, to form a suitable mixture for economic smelting. The district is traversed by the Canadian Pacific Railway from Sudbury to Sault Ste. Marie, and bounded on the south by Lake Huron. Freight on coke and coal from the United States is low, and if it is settled that coal for coking purposes can be introduced free of the present duty of 53 cents per ton of 2,000 pounds, another industry would be added to the national wealth. In the event of the Provincial Government granting a bonus on refined copper, capital might be induced to erect a refinery, this, indeed, being the programme which the Copper Mining & Smelting Company of Ontario have seriously considered. The Governments, both Dominion and Provincial, have voted subsidies to the Bruce Mines & Algoma Railway, which traverses the property from south to north, and this, if pushed on to the C. P. R. main line at Chapleau, and thence on to the Grand Trunk Railway, now in course of construction, would open out great wealth in timber and mineral, and tap the great Clay Belt. But nothing is being done. Aid to improve existing roads and make new ones would be highly beneficial, as the writer is of the opinion that the solution of the whole problem of making copper mining a great success may be found in the erection of local smelters.

Having thus brought the history of Bruce Mines up to the present date, it may be stated in conclusion that since the first Exhibition in Hyde Park, London, England, 1851, to the St. Louis Exhibition in 1904, exhibits from these mines have gained medals for the display of ore, etc.

The high price of copper must have been a great inducement for the first owners of the property, as the following will show:—

	Per ton
1853	£136-16-0
1854	£140- 2-0
1855	£141-10-0
1858	£140- 0-0

To-day the market price is £102 per ton. Is it possible that we are again approaching a period of high prices, when the present company, with modern appliances and easy transportation, will reap greater benefits than were ever derived by former shareholders at the highest point of their prosperity.



PLATE VII.—East End of 400-ton Mill. The Copper Mining & Smelting Company of Ontario, Limited, Bruce Mines, 1906.

The writer has purposely not dwelt at length on the geological features of the area, as the report now in course of preparation by Messrs. Ingall and Denis, of the staff of the Geological Survey of Canada, embodying, as it does, the work of two years in this neighborhood, will, when published by the Department (a preliminary report having already appeared in 1904*), afford a far more complete generalization than can here be attempted.

By a series of careful experiments it has been established that the corrosion of iron is not caused by the presence of carbon dioxide in the atmosphere, but by oxygen in conjunction with water. While carbon dioxide is not essential, it may accelerate the reaction.

The amphibale group of minerals are of similar composition to the pyroxenes. Trimolite, actinolite and hornblende are the chief members of this group. The fibrous minerals, asbestos and amianthus, are varieties of trimolite and actinolite. Hornblende forms a rock by itself and is an essential constituent of diorite, syenite, andesite, gabbro, and many crystalline schists.

GOLD MINING IN NOVA SCOTIA

By Geo. W. Stuart.

I have been asked to express an opinion as to the cause of the decline of gold mining in Nova Scotia.

The question would imply rather an erroneous impression, one not entirely borne out by the facts as established by the Government statistics. Last year, 1906, the yield of gold, by the sworn reports at the mines office, when compiled, will exceed 14,000 ounces. In no less than ten different years during the period since the inception of gold mining in the province (1862), the yield fell below these figures. The returns of 1874 show the minimum yield of 9,140 ounces, and the returns of 1898 show the maximum yield of 31,104 ounces. From 1872 to 1881 there was but little life, energy, or money, put into the business; therefore, with the exception of 1877, when the yield reached 16,882 ounces, the returns were, approximately, but from 9,000 to 13,000 ounces.

In 1881 there was conceived a new hope for the industry, caused by the discovery of a rich lead in the Montague district, known as the "rose lead." This lead was discovered far away from any float or drift, that escaped from it. The discovery was made through scientific conclusions and research, put into execution for the first time in the province. The methods adopted were freely made known to others, and soon other leads of much value were unearthed; among which was the new Caledonia, or DeWolf lead, in Montague, and the Dufferin at Salmon River, both large producers. From this date the yield steadily increased, until, in 1898, it reached the maximum above stated, 31,104 ounces. For the five succeeding years the average yield was 28,500 ounces, but in 1904 it dropped to 14,279 ounces. It will, therefore, be seen, by the above figures, that many times during the 45 years gold mining has been in progress in Nova Scotia it has been at a lower ebb than at the present time; at least less gold was reported to the Mines Office, as obtained.

Presuming that the greater portion of this gold obtained was mined at a profit, some idea may be formed of the great difference in the thicknesses of the veins it has been taken from, when we find by the tonnage returns so vast a difference in yield per ton. For instance, in 1865, 24.423 tons of ore yielded 25,454 ounces of gold—more than $20 per ton. In 1882, 12,081 tons yielded 14,107 ounces, an average of $23 per ton, while in 1902, 192,076 tons yielded but 28,279 ounces, only an average of about $3 per ton of ore. It is not to be inferred, however, that the $3 ore may not have been mined at a profit, or that the $23 ore was mined at exceedingly great profit; but it is a reasonable conclusion that the initial expense for plant and appliances to mine large quantities of low grade ore, at a profit, is much greater than that of a plant to mine and mill small veins of rich ore.

Since 1882 the average yield of gold per ton of ore mined and milled has gradually—with some fluctuations—been lowering, until to-day the average is about $5 per ton. The leads, however, now being worked are, in the main, much larger than the average in the earlier years of gold mining, and, I believe, though under adverse circumstances, to which I will shortly refer, all the mines now working for profit—and not simply doing development work—are succeeding.

Why the presumed decline? is the question I am asked. My answer is that there is a combination of causes and circumstances for the present unsatisfactory condition of gold mining in the province, none of which are the causes generally assigned by those of the outside world who are not in a position to know all the facts. Some, at least, of the causes I am about to refer to, could have been, and should have been, avoided, and some can be remedied yet, if those in power would take the slightest interest in the welfare of this industry.

Cause 1.—In the early years of gold mining in the province—up to the eighties—Nova Scotia miners were in plenty, at most reasonable wages; later, many of these men—some of the best of them—went West, where they obtained much higher pay; and later, after the great mining boom started in our Western country, our miners practically deserted us, until, during the last eight or ten years, the greatest difficulty has been experienced in getting and keeping experienced men to operate our gold mines. Nova Scotia miners, when opportunities are afforded them, are recognized throughout this continent as being rather a superior class of workmen, and therefore they have been able to obtain wages abroad that the operators of mines here felt they could not afford to pay; therefore it has been constantly necessary to employ green men, and the experience has been that too many of them, as soon as a reasonable knowledge of the business is acquired, take flight to the regions where there is more boom and more excitement, and, as they believe, greater opportunities. Thus, mine operators are often left with their mines less than half manned.

Cause 2.—The excessive cost of fuel for power has played a most serious and paralyzing part in the cause; perhaps the greatest in the catalogue. Our mines are largely on the sea coast, mostly of easy access to shipping. Throughout all the early years of mining, and up to the taking over, under new leases from the Government, the large aggregation of coal mines in Cape Breton by the Dominion Coal Company, we were able to buy coal delivered at our wharves at a cost of from $1.75 to $2.75 per ton. Since the advent of this Dominion Coal Company into this country the price of coal in Nova Scotia has been nearly doubled in cost to us. This is a most serious drawback, and is the chief cause for the closing of a number of mines. Particularly has this been the case in the operation of low grade ores, on which the prosperity of the industry must depend in the future. This cause could have, and should have, been provided against by the Government when granting new coal leases to this powerful company.

It has been found, too, that in some of the more inland districts, where wood for fuel has to be used, and is fairly abundant, the large timber limit owners, who have acquired boundless areas at the nominal cost of forty cents an acre—surveys paid for by the Government—have put on practically prohibitory prices for wood, though only fit for fuel, and of no use for milling purposes. Thus the fuel question is the most serious one for all the districts.

Cause 3.—Large blocks of valuable areas are held in many of the districts by men who are, in some cases, mere speculators, and by others who are of the dog-in-the-manger type. These idle sections are entirely apart from those referred to, which have been closed down for the causes above mentioned, and this evil can only be remedied by an amended act.

Cause 4.—Much of the gold contained in our ores is coarse and nuggetty, and it has been a well-known fact that gold stealing has been practiced to an extent, in some mines, that necessitated closing them down; and yet, as the law is at present, no man can be convicted of stealing gold unless he is caught in the act. A workman may be found with any quantity of gold on him, or in his possession, but the owner—the man he has stolen it from—cannot prove it is his unless he—the thief—has been seen to take it. In Australia they have a law making it incumbent upon the possessor of unwrought gold to prove how he came in possession of it. This law has worked well, and has done wonders for the preservation of the mine owners, and the stimulation of the industry in that colony—where legislators look after the best interests of those who are legitimately developing its industries. These facts have been clearly shown to the Federal Government of this country, and for the past five years we have, through the Mining Society of this Province, been praying for such a law to protect us, but our appeals have been in vain.

None of the causes above enumerated can be charged to the gold mine owners. There are some causes, however, that lie at their own doors, and one is the indifference there has been exhibited in the gold-saving appliances. We have depended, practically, entirely on free amalgamation in the past, resulting,

beyond any shadow of doubt, in a large percentage of gold being lost, going out over the plates with the tailings, and being ultimately deposited in the lakes and swamps. I may say also that Nova Scotia has not escaped the consequences of reckless, incompetent and dishonest management. Perhaps we have had more than our share of such here.

Chiefly because of the reasons I have enumerated here, Nova Scotians have become discouraged, and capitalists abroad have become suspicious that our mines are not of a permanent character, and that they are too expensive to work.

I do not believe such conclusions are justifiable, and I trust, and believe, the two foreign companies now operating here, one in an eastern district and the other in a western district, will fully demonstrate the error of such conclusions. They have both adopted the modern cyaniding system of saving gold.

I believe there is yet a prosperous future for gold mining in Nova Scotia. We must, however, have faith sufficient to do more underground exploration work, and we must divest ourselves of the too prevalent idea that all pay zones in all lodes crop to the surface sowewhere; operations in the past have practically been confined to lodes discovered by such out-croppings.

We must also take advantage of the numerous water powers now running to waste, and install electric plants that will make us less dependent upon the fuel situation.

Truro, N.S., Feb. 20, 1907.

THE LONG WALL SYSTEM OF COAL MINING

By T. W. Gray, Glace Bay, N. S.

The Emery seam, which lies at a depth of about 160 feet below the Phalen seam in the Glace Bay coal field, is being worked by the Dominion Coal Company at their reserve mines on the long-wall extraction method, for which it is admirably suited. The seam has a good strong roof, which breaks well, and consists of about four feet six inches of clean, hard, bright coal of good quality, very suitable for domestic or steam-raising purposes.

"Long wall" is somewhat of a novelty in Cape Breton, at least in the Glace Bay district, and the native miner, who has been used to board and pillar workings in seams from six to nine feet high, does not take very kindly to the more confined areas of a four foot six inch seam. As a result, the Emery mine at reserve has become more or less of an "old countryman's mine," long wall being almost universal on the other side of the water. Quite a number of continental miners are employed here, particularly Belgians, who are good men for the work, and, after the tortuous and heated workings to which they have been accustomed, they find agreeable conditions in the cool and shallow mines here.

The coal is undercut five feet six inches with a compressed air disc coal-cutting machine, made by the Diamond Coal-Cutter Company, of Wakefield, England. The Coal Company have about half a dozen of these machines.

At present there are only two short faces, five hundred and two hundred and fifty feet long respectively, producing about three hundred tons a day, but they are being rapidly extended.

The product of long wall operations is very blocky and strong. It is not powder-shaken, because the roof weight is sufficient to break down the undercut coal with the expenditure of very little or no powder.

A portion of the Phalen seam at No. 6 colliery (Big Glace Bay) is also being worked on the long wall plan, with marked success. There can be no doubt that these are only the beginnings of a more extended use of this method, as the thicker seams, which do not lend themselves to long wall, become exhausted, and the development of long wall work in Cape Breton will be followed with great interest by mining men, as it will involve radical changes in present conditions, both technical and economic.

In England, the use of long wall coal cutters, combined with conveyor belt systems along the face, has rendered it possible to profitably work seams as thin as 16 inches.

T. W. Gray.

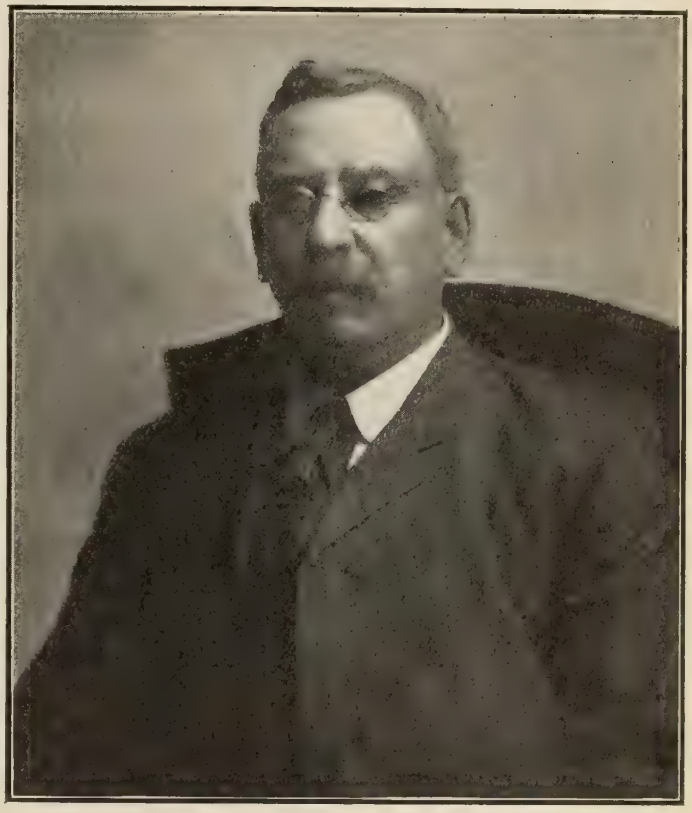
Glace Bay, N.S.

INDUSTRIAL PIONEERS OF CANADA

Born in New Glasgow, in 1846, Mr. Fraser showed early in his career a decided leaning towards mechanical work.

As an apprentice he worked for some years at blacksmithing in Providence, R. I.

After marrying Miss Charlotte Dicks, of Pictou, he returned to his native town. His first important work resulted from securing a contract for the iron work of the wooden vessels then being built by Mr. Carmichael.



Graham Fraser.

In 1872, Mr. Fraser, along with Mr. G. F. McKay, established the Hope Iron Works, with a capital of $4,000.

After a year of successful work, a steam hammer was added to their equipment. Then another steam hammer was acquired, and the name of the firm was changed to the Nova Scotia Forge Company. In 1878 the forge works were removed to the present site of the steel works at Trenton, near New Glasgow.

In 1882 Mr. Fraser issued the prospectus of the Nova Scotia Steel & Coal Company, and, until December, 1903, he was the vice-president and managing director of that sound and flourishing enterprise. From that date until January 1st, 1904, he filled the offices of director and director of works for the Dominion Iron & Steel Company, of Sydney, N.S. Mr. Fraser resigned this important position as soon as he had accomplished the task of re-organizing the Steel Company. Since then he has not taken any active part in business.

To Mr. Fraser belongs the credit of having first conceived the idea of establishing a great iron and steel plant at Sydney. Asso-

ciated with Mr. Fraser in much of his work, such men as his brother, Mr. Simon A. Fraser, Mr. Thomas Cantley, and Mr. Harvey Graham, have won prominence.

Mr. Fraser is a most unassuming, pleasant Pictou County Scotchman. Intelligent industry and unswerving integrity have been the keystones of his success.

ROASTING OF THE ARGENTIFEROUS COBALT-NICKEL ARSENIDES OF TEMISKAMING, ONT., CANADA*

Cyril W. Knight.

The Cobalt ores consist essentially of arsenides of cobalt and nickel, together with native silver. In going over the literature on roasting of arsenides, no definite data could be found which gave accurate information regarding the temperature at which arsenic is expelled during roasting operations. A few experiments

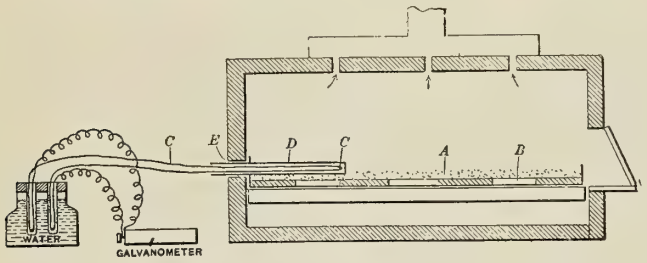


Fig. 1.

were therefore undertaken, with the object of throwing some light on this point; and it was also thought that the metallurgical plants now being erected in Ontario to treat our Cobalt ores, might, perhaps, obtain some information from the work.

The roasting was done in an American Gas Furnace Company's oven, No. 2 (Fig. 1), 27 inches long and 20 inches wide inside.

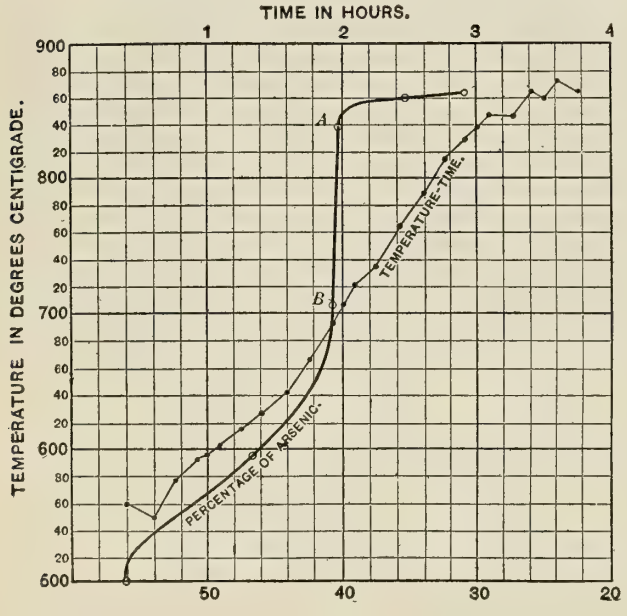


Fig. 2.

The ore was held in iron pans, lined with 0.5 inch fire-brick, B. "The temperature was measured by means of a Le Chatelier pyrometer. The thermo-couple, C, was protected from arsenic and other fumes by a porcelain tube, D, and was placed immediately above the ore, A. It entered through a circular hole, E, in the back of the furance, and was connected with a Keiser and Schmidt galvanometer, standardized by means of the melting-points of zinc, aluminium and copper. The temperature was recorded and the ore rabbed every ten minutes. In none of the roasts was any fritting or clogging of the ore noticed.

The first object was to ascertain the temperature at which the arsenic is most rapidly expelled. The ore treated was ground to pass a 20-mesh sieve. The furnace was gradually heated at the rate of 120 degrees C. per hour to a maximum of 870 degrees C. It was found that, during this roast, 27 per cent. of the total arsenic was expelled below 700 degrees C. That practically no arsenic was expelled between 700 degrees C. and 840 degrees C., but that, on reaching the latter temperature, expulsion again became rapid. This is diagramatically shown in Fig. 2. These results tend to prove that the behavior of smaltite resembles that of pyrite, of which the first atom of sulphur is removed at a much lower temperature than the second.

The second object was to ascertain how thoroughly arsenic can be expelled at 890 degrees C. (a temperature a little above that at which it was found that arsenic is rapidly driven off). The furnace was raised quickly to 890 degrees C., and held near that temperature for four hours. The arsenic content at the end of the roast was about 17 per cent. During the first three hours it fell to 19.3 per cent.; the effect of the last hour of roasting only reduced it to 17 per cent. Fig. 3 gives a curve showing diagramatically the results of the test.

It was found that charcoal, whether added at the beginning or towards the end of the roast, failed to increase the expulsion of the arsenic. In one experiment the ore treated was ground to pass a sieve of 100 meshes to the linear inch. This did not increase the amount of arsenic driven off.

*Summary of a paper published in the Transactions of the American Institute of Mining Engineers, April, 1907, by Henry M. Howe, LL.D., William Campbell, Ph.D., and Cyril W. Knight, B.Sc., respectively professor, instructor and student of metallurgy in the School of Mines of Columbia University, in the city of New York.

ASBESTOS DISCOVERIES IN FOREIGN COUNTRIES

By Fritz Cirkel, Mining Engineer, Montreal.

Those familiar with the asbestos market are aware that the present supply of asbestos is not sufficient to meet the world's demand. This is principally due to the increasing uses and applications of the mineral for industrial purposes. It may be affirmed that the output of all the existing asbestos mines is insufficient to satisfy two-thirds of the demand for this product, and the leading manufacturing firms interested in this industry are diligently searching for new deposits. As a matter of fact, European manufacturers, who find the supply insufficient and irregular, have endeavored to acquire asbestos mines in Canada, but have been confronted with many difficulties, especially in the comparatively small Thetford-Black Lake asbestos area, there being comparatively few productive mines, and these can only be had at exorbitant prices. For this reason, European manufacturers, for the last year or two, have been informing themselves of opportunities in other countries. Thus, Englishmen propose to acquire some recent discoveries in Western Australia, in the vicinity of Perth, where, it is reported, asbestos of quality equal to the Canadian product has been found, although information regarding the location and extent of the deposits is being kept a close secret.

We hear also that renewed attention is being paid to the Ural (Russian) deposits, but whether they ever will assume the importance of the Canadian mines remains to be seen. Two deposits of asbestos were discovered last summer on the Ural, one in the Verchotursky and the other in the Ekaterinbourg districts of the Province of Perm. In the first named district prospecting is carried on by a mining engineer, Mr. A. L. Simchowitch, in a locality called Znamenskaia Datcha. By order of the chief administrator of the Ural mines, the above area was declared free for exploration, and the right to prospect was granted to Mr. Simchowitch for a period of five years.

These asbestos deposits were discovered quite accidentally last

spring, and are located in the very midst of a village, near to some chemical works.

Asbestos mines on the Ural have been in operation for years, and, from the statistics available, the production is steadily increasing. Particularly well regulated is the asbestos manufacture at the asbestos mines at Korevo, thirty versts from Bajenovo Station on the Perm Railway. The entire district is covered with heavy drift material, containing auriferous sand and precious stones, such as emerald, amethyst, topaz, spinel, beryl, etc.; in fact some of the best emerald mines are situated in this district. The country is moderately flat. It is densely timbered, and for this reason prospecting is a difficult task. The formation is a weathered serpentine, much decomposed, and evidently has undergone many disturbances. The asbestos is found in cracks or fissures, similar to the slickensides in Thetford and Black Lake, and is, to some extent, discolored. It is of a fine and silky texture a true asbestos, a form of fibred tremolite and hornblende, and its principal value for manufacturers lies in its tensile strength.

It is not, however, as silky as the Canadian chrysotile. The fibre is a little coarser, of slightly yellow color, and is well adapted for spinning purposes. Most of the asbestos is short, fibre of two and two and a half inches in length being very rare. Two companies are working in the district, the "Poklewsky Kosell" and the "Korrewo Company." The former is the largest company in the district, and employed at one time 5,000 men. But the drawbacks for a healthy and steady progress of the industry are great, the principal ones being the shortness of the season, which lasts only six to eight weeks, and the remoteness of the district.

The mines are remarkable for the fact that, even with a production of 1,500 to 1,700 tons of asbestos per season, the mining work is all done without the aid of machinery or explosives. The ground carries more asbestos to a given area than the Canadian mines, but the veins are not so thick, nor is the color very white. Mining operations are carried on upon a very antiquated system, while a proper milling plant does not exist. Experiments in milling are, however, in progress, and are vivid reminders of what occurred at the Quebec mines years ago. The working force at these mines numbers, as a rule, up to 1,700 men in the season, and is recruited from the Russian Muzhiks or peasants. The wages paid ordinary labor are about thirty-three to thirty-eight cents a day, with free sleeping quarters. These mines, as a rule, suffer from a scarcity of labor during the harvesting time. Adjacent lakes will prevent them from ever attaining the depths of our mines, owing to the very porous and disturbed nature of the rock, the lakes being on nearly the same level as the mines.

MINING POSSIBILITIES IN THE PROVINCE OF QUEBEC

(By Fritz Cirkel, M.E., Montreal.)

(Toronto Meeting Canadian Mining Institute, 1907.)

The establishment of a mining industry in the Province of Quebec is of long standing, and it were, therefore, reasonable to expect that mineral production from this Province should be proportionately considerable. But this is not the case. In 1905 the total value of the minerals produced amounted only to $3.750,-000, an insignificant aggregate in relation to the importance and the varied mineral resources of the area. The question arises, to what cause is this unsatisfactory state of affairs attributable?

The public as a rule finds ready explanation in blaming government for slow industrial progress; but in the present instance this can not be done in fairness. Enquiring into conditions connected with the Quebec mining industry, we find that the Provincial Government has done much to promote mining, and the laws governing the latter are as liberal as can be found in any other mining country, where conditions are similar; and we must, therefore, look elsewhere for reasons.

Meanwhile, if we examine statistics published annually by the Quebec Government, we will observe that the precious metals are absent from the list, and the entire production, practically, is that of minerals not classed as precious.

Thus we have, among others, mentioned:

Iron ore, with gross value of production of		...	$ 35,268
Chromic iron	"	" ...	104,565
Copper ore	"	" ...	128,850
Asbestos	"	" ...	1,476,450
Asbestic	"	" ...	31,100
Mica	"	" ...	95,460

Considering the mineral potentialities of the Province of Quebec, this showing is most inadequate, and the reason thereof is solely attributable to the indifference of the public. Nowadays fabulously rich finds in other provinces of the Dominion have attracted wide attention, and it is not difficult to find capital for the exploitation of precious mineral deposits of even questionable value. But it is difficult to interest investors in deposits of base minerals in this Province promising safe and fair returns on money invested. This point might be illustrated by numerous examples which have come under the writer's notice. But reference need only be made to the absence of interest in our magnetic iron resources by way of demonstration.

It is well known that the Province of Quebec is very rich in iron ores, especially in magnetic iron; these deposits are distributed along the banks of the St. Lawrence, Ottawa and Gatineau Rivers, and are of good quality, quite equal to the Swedish ores.

The magnetic sand deposits on the north shore of the St. Lawrence were discovered over forty years ago, but remain still undeveloped. These deposits are of considerable magnitude at certain points, such as at Moisic, Mingan, Betsiamits, Natashquan, Kagashka.

The magnetic sand is found almost on the surface in stratified beds from one-half inch to six inches thick, but sometimes attaining a thickness of from one and one-half to two feet. These deposits extend over large surfaces on the coast, in some instances for several leagues. Besides magnetic iron, this sand contains quartz, red garnet and titanic iron.

But the principal magnetic iron ores are located in the Township of Pontiac and in Hull, north of Ottawa. In each of these localities, mining operations were carried on some thirty or forty years ago; but work was discontinued, not on account of a falling off in the quality or quantity of ore, but in consequence of loss in handling. Separation methods for the purpose of freeing the iron ore from the gangue are of comparatively recent date; and by these means mines which formerly could not be profitably operated can now be made to pay handsome returns. Most people, acquainted with the early operations of these mines, when approached for an opinion regarding their present value, refer to former failures and express an unfavorable view, forgetting that conditions now have greatly changed for the better, and that these former failures were ascribable to the one cause already

explained. In proof of this contention the mines of the Adirondack region may be instancer.

There has ever been a disposition to under-estimate the great importance of the magnetic iron ores of the Ottawa and Pontiac counties, the specific objection raised against the availability of the ores in that region being that the cost of fuel to smelt the ore is prohibitive. With the steadily decreasing quantity of coal required per unit of finished product, due to the better utilization of fuel by modern methods, this objection is, however, of lessening importance, while on the other hand we have these favorable factors: The ores are rich, the bodies are large, and cheaply mined, for little timbering or pumping is necessary. The objection is occasionally raised that magnetic ores are not as readily reduced in the furnace as hematites, and are, therefore, not worth as much to the smelter. In a general way this is true, although one fact deserves consideration, and that is that magnetites are practically free from moisture, so that their carriage is proportionately less. It is estimated by one of the leading furnacemen in the country, that magnetite involves an extra expenditure in smelting of about twenty-five cents per ton of pig, and even that is only a general statement, since there is considerable difference in the ease with which different magnetites are reduced in the furnace. An interesting practice bearing on this point has been developed at the Wharton furnaces, where New Jersey magnetites are roasted in kilns fired with waste furnace gas, or with producer gas, before being charged into the furnace, a practice for which important economics are claimed.

Another feature which speaks greatly in favor of cheap reduction is the enormous amount of available water power in the vicinity of the mines, which could be readily used for the production of electric energy in electric smelting, as suggested by Dr. Haanel, Dominion Superintendent of Mines; and reference may be here made to the Chats Falls, on the Ottawa River, near the Bristol Mines, and to the Chelsea Falls, on the Gatineau River, in the vicinity of the Ironsides Mines, where more than 50,000 horse-power can be cheaply produced for general mining and smelting purposes.

Referring to the concentration of these iron ores, which are to a great extent of low grade, it should be stated that the Port Henri mines in the Adirondacks, where conditions are similar to those obtaining in the Ottawa and Pontiac counties, have successfully adopted separation processes.

For years the concentration of low grade ores by some form of electro-magnetic separator has attracted the interest of the miner and inventor alike. Among the first to test and develop processes of magnetic separation in the Adirondacks were Witherbee, Sherman & Company, who were called upon to meet two sets of conditions. The New Bed and Harmony ores, low in phosphorus and varying in purity from 40 to 69 per cent. iron, form one group, while Old Bed ores, practically of uniform grade at 60 per cent. iron, but high in phosphorus—1.35 to 2.25 per cent.—form the second group. The magnetic separation, or rather purification, of the latter is particularly interesting and unique, the problem being to eliminate the apatite or phosphorus-bearing gangue, which is practically non-magnetic. The apatite varies in color and in the size of crystals. These two characteristics have a bearing upon the degree of concentration possible. In the case of the apatite of a deep red color the magnetic characteristics are sufficient to carry at times an appreciable percentage of the free crystals into the iron concentrates. Then, too, these deep red crystals adhere more tenaciously to the crystals of magnetite than the green or yellow varieties. The yellow apatite crystals break away most freely from the magnetite. When the magnetite is a shot ore, or of large crystalline structure, it is not difficult to bring the ore into a condition admitting of practical concentration. When the ore is massive, or the crystals of magnetite and apatite are both small and finely disseminated throughout the mass, finer crushing is necessary for the same degree of concentration.

In order to meet these conditions of the ore, it has been found necessary to carefully prepare the ore by crushing, drying and sizing before treating it on the magnetic separators. Aside from this treatment for physical peculiarities of the ores, a rough cobbing is made at the pit head, the first-grade product being sent direct to the furnaces and the second-grade ores being sent to the separators, except at such times when the whole run of mine is concentrated.

To make the Old Bed high phosphorus ores of more value to the blast furnaces, Witherbee, Sherman & Company built a separating plant about two years ago, and later erected another mill, to care for the total output of this grade of ore. During the two years of operation of the plants the methods of treatment have been improved from time to time to assure uniformity of product. While from the start the process has been a commercial success, the improvements introduced have tended to lower the percentage of phosphorus. It is very doubtful if a true Bessemer product can ever be made from Old Bed ores, yet the limits of variation in the phosphorus of the concentrates are being narrowed.

The separating plant is divided into three main sections, the crushing plant, the separating plant and the re-treating plant. Each of these product divisions is also made a power division, a motor being so placed as to control the machinery and conveyors in each division without reference to the others. In the original plant direct current motors are in use; in the second plant alternating current is the motive power. Between each division there are interposed bins, which, through their storage capacity, make it possible to operate each section individually for about two hours without obtaining fresh supplies from the preceding section.

Crushing Division.—The crude ore is first crushed in a 30x18.inch Blake crusher, operating at a speed of 250 revolutions, to 1.50 to 2 inch cubes. The resulting product is then passed over a screen of 0.75 inch opening, the oversize being crushed to 0.75 inch cubes in a Blake 36 x 6 inch double jaw crusher, running at 225 revolutions. The material passing through the screen and the crushed product unite, and are again screened over a six-mesh screen, the ruling size of the mill. The oversize is crushed in a set of 36 x 14 inch Reliance rolls, of Allis-Chalmers make, running 100 revolutions. The troughs of the screens and the product of the rolls unite, and the combined materials are passed through a dryer.

The dryer is a square vertical stack, with baffle bars placed at right angles to one another in alternate sections, there being eight sections with six rows of bars to a section, and six bars to a row. In falling over these bars the body of ore is broken up and permits a free circulation of hot air throughout the mass. The ore being fed in at the top of the dryer, passes constantly into a hotter zone, the heated gases from the grate passing from bottom to top of the stack. On discharging at the bottom of the dryer the ore is elevated to a tower screen, having 288 square feet of screening surface. This screen is divided into equal sections of 30, 16, 10 and 6 mesh screens. The product of each size screen is delivered to a separate pocket in a bin. The oversize of the screens is returned to a set of 36 x 14 inch Reliance rolls, so placed that the product of the rolls meets the original stream from the dryer. By this arrangement material is confined to a closed circut, the only outlet being through the screens. The finest screens of the series are placed at the top, in order that the coarser particles may scrub the fine material through and cause a more effective sizing.

The object sought by frequent screening is the elimination at each stage of the coarse ore, thus preventing pulverization. That the process amply pays is shown in the fact that of the total shipping product about 65 per cent. consists of particles larger than ten mesh—an ideal ore for blast furnace use, as has been fully demonstrated during the past two years.

Separating Division.—Under each pocket of the bin is placed a Rowand Type F magnetic separator, treating one size ore. Ball & Norton separators have lately been introduced on the 30 and

16 mesh sizes. These separators operate in conjunction with the Rowand machines. Both makes of separators are so arranged as to make heads and tails. The heads, or concentrates, are sent direct to the shipping bin, and the tails, containing iron, apatite, hornblende, and a small quantity of silica rock, are re-treated.

Re-treating Division.—The tails from the Rowand Type F and Ball & Norton separators are passed over a screening surface of 72 square feet, equally divided into 20 and 16 mesh sizes. The oversize is passed to a Wenstrom magnetic separator, where the free iron remaining in the tails of the previous separation is recovered, the Wenstrom tails being returned to the 20 and 16 mesh screens after having been re-crushed in a set of 36 x 14 inch Reliance rolls. The product of the rolls meets the original stream from the Rowand Type F and Ball & Norton separators. As in the previous instance, the tails for re-treatment are in a closed circuit and must pass through the screens or over the Wenstrom separator. That portion which has passed through the screens is then treated upon two Wetherill Type E separators. The iron is first removed and is passed into the iron concentrates, along with the concentrates from the Wenstrom separator mentioned above. The hornblende forms a middlings product from these separators, and is passed off as mill tails. The apatite and silica being non-magnetic, form the tails of the separator and are classed as apatite concentrates, carrying from 60 to 65 per cent. bone phosphate. The mill tails carry sufficient apatite to raise the percentage of bone phosphate to from 40 to 45 per cent., and form a second or low grade apatite concentrate.

The concentration operation thus produces three products of market value, iron concentrates, apatite concentrates, and second-grade apatite concentrates.

The mills are each capable of treating 800 tons of crude Old Bed ore in 20 hours. Of the crude material 85 per cent. is recovered as iron concentrates, the 15 per cent. of tailings being equally divided between the first and second-grade apatite concentrates. On a basis of 800 tons of crude ore the products would be as follows:—

	Tons.
Crude ore	800
Iron concentrates	680
First-grade apatite concentrates	60
Second-grade apatite concentrate	60

The average analyses for the past ten months are as follows:—

	Iron	Per cent. Phosphorus	Bone Phosphate
High phosphorus Old Bed crude ore	59.59	1.74	.....
Old Bed concentrates	67.34	0.675	.....
First-grade apatite concentrates	3.55	12.71	63.55
Second-grade apatite concentrates	12.14	8.06	40.30

The other elements of Old Bed concentrates are:—

	Per cent.
Silica	2.20
Manganese	0.08
Alumina	0.90
Lime	3.84
Magnesia	0.31
Sulphur	trace

These mills are also capable of treating 600 tons of Harmony and New Bed crude ore in 20 hours. Of the product 77 per cent., or 462 tons, are recovered as concentrates, the remaining 23 per cent., or 138 tons, being discharged as tailings. These tailings are used for granolithic and concrete purposes, railroad ballasting and marble facing and cutting, the sharp edges of each particle being a far superior medium than water washed sands, where the edges have been destroyed by the action of the water.

Analyses of Harmony cencentrates, from October 2 to November 13, 1903, gave the following results:—

	Per cent Iron	Phosphorus
Lean Harmony crude ore	50.26	0.295
Harmony concentrates	64.10	0.133
Harmony tailings	13.97	0.877

From the above general description of the Port Henry Mines it will be seen that most of the successes are to the eleborate system of concentration and mine equipment, and that the initial difficulties which had to be overcome in preparing the lean ore for the market are similar to those confronting us in Canada. No attempt has yet been made in this country to concentrate our magnetic iron ores on an economic scale, although the deposits contain very large quantities of lean ore accompanying the rich streaks. It is impossible to make these mines pay by simply cobbing the ore, as was done years ago, but if capital were to undertake in earnest the utilization of these resources by the employment of modern methods of concentration, it might expect with assurance a rich reward.

REPORT OF THE ONTARIO BUREAU OF MINES FOR 1906

This fifteenth annual report of the Ontario Bureau of Mines contains much well-arranged, carefully-edited information. Both its appearance and its contents reflect credit upon the Department. It is profusely illustrated, and, typographically very little is left to be desired.

In Part I. a statistical review is followed by Dr. W. L. Goodwin's report upon the Summer Mining Classes, which were conducted in many of the remoter mining camps. About 550 persons received instruction by means of these classes. Nearly all of those attending were given sets of forty specimens. Much appreciation was shown by miners and prospectors.

Mr. E. T. Corkill's report on the Mines of Ontario covers the whole Province. It is edifying to glance over the variety of minerals being profitably mined in Ontario. The whole gamut is run, from gold and silver down through copper, zinc and lead to talc, fluerspar and marble.

Mr. Eugene Coste summarizes the progress of the natural gas and peroleum industries.

"Reports upon Exploration in Mattagami Valley," by Mr. H. L. Kerr; upon the "Agricultural Resources of Mattagami," by Mr. Archibald Henderson, and upon "The Amimikie Iron Range," by Mr. L. P. Getini, are succeeded by Dr. A. P. Coleman's paper on the "Iron Ranges of Eastern Michipicoten." In a note on the Helen Iron Mine, Dr. Coleman mentions an interesting occurrence of yellow ochre, disclosed by draining operations, at the east end of Old Boyer Lake; and shows that this phenomenon, along with the formation of concretionary limonite in shallow water, may be taken as evidence that solution of the ore and subsequent deposition is still going on. This district will evidently respond to detailed investigation. Additional notes on Michipicoten, by Mr. E. S. Moore, close Part I.

In Part II., under the title "Clay and the Clay Industry of Ontario," Mr. M.B. Baker deals exhaustively, clearly and well with a subject which deserves especial attention. Professor Miller, in a short preface, writes thus: "The more stable but more prosaic mineral industries of a country are apt to be somewhat neglected for those which appeal more strongly to men's imagination or cupidity. The clay working industry, which, next to agriculture, can be called the most ancient of industries, has up to the present been almost ignored by scientific workers, although during late years in Germany, the United States, and in other countries, it has been receiving more attention. Several . . . countries now have departments devoted to the study of clay and its products. In Ontario the clay industry has grown rapidly during recent years. Brick, which is cheaper than stone, is being used in modern cities in place of wood for fire protection purposes. As years go on the clay industry must become proportionately more important. It is well, therefore, at this time, for Ontario to have a systematic report, such as that of Mr. Baker's on 'Clay and the Clay Industry.'"

In this we most heartily concur. Space will not permit us to dwell further upon Mr. Baker's report. But it is our intention to take it up in detail at a later date. Meanwhile, we recommend it as a wholesome and appropriate antidote for Cobalt fever.

Some Notes on the Economic Geology of the Skeena River

By W. W. Leach, Ottawa, Ontario.

(Toronto Meeting Canadian Mining Institute, 1907.)
By permission of the Director of the Geological Survey of Canada.

Since the Grand Trunk Pacific scheme was first projected, a great deal of interest has been aroused in the potentialities of the country through which this road will pass. Up to the present, however, the attention of the public has been turned chiefly to the eastern and prairie sections, the uncertainty of the route through the mountainous districts of British Columbia having deterred many from exploring that part of the country in the hope of locating valuable minerals, lands and timber in advance of the railroad.

At the present time it seems fairly definitely settled that the road will pass down at least part of the Skeena valley, and during the past two seasons a number of prospectors have found their way into that district, many coal and mineral claims have been staked, and a great deal of the available arable land taken up.

Although this was one of the first parts of British Columbia to be traversed by the earlier explorers, Sir Alexander Mackenzie having crossed from the Peace River to Bella Coola on the Pacific (passing a short distance south of the Skeena waters) as early as 1793, very little is yet known of the economic geology of the region. The only official reports, known to the writer, dealing with this subject are those by Dr. Dawson, contained in the Report of Progress of the Geological Survey for the years 1879-80, and by Mr. Wm. Fleet Robertson, the British Columbia Provincial Mineralogist (see Report of Minister of Mines, B.C., 1905). Dr. Dawson's work consisted of a hurried exploration from Port Simpson to Edmonton, following the main travelled trails, and with the map accompanying it, affords the only reliable information of much of this country to-day. Mr. Robertson's report, as far as geology is concerned, deals chiefly with a number of prospects in and adjacent to the Bulkley valley.

Up to the last few years little or no prospecting has been done in this great district, if we except the placer miners, who have overrun the greater part of it pretty thoroughly, but without any very startling results.

The rocks of the Skeena River may be roughly grouped into four main divisions, to which, in their southern continuation in the neighborhood of Francois Lake, Dr. Dawson has applied the following nomenclature, beginning at the oldest:—1st, The Cascade Crystalline Series; 2nd, The Cache Creek Group; 3rd, The Porphyrite Group; and, 4th, Rocks of Tertiary Age.

The Cascade Crystalline Series extends in a belt along the coast and is crossed, more or less at right angles, by the river, and has here a width of 50 to 60 miles. These rocks consist chiefly of gneises, granitic rocks and micaceous schists, generally much disturbed and usually found dipping at high angles; they are supposed to be of Palæozoic age, probable carboniferous or older. Up to the present they have not been found to contain many large or valuable mineral deposits, although various minerals of economic value have been reported as occurring in these rocks at different localities in this neighborhood, notably, pyrrhotite and chalcopyrite on the Tshimpsian Peninsula, back of Port Simpson, galena and copper pyrites at the head of Kitamat Arm, and iron ore on the Ecstall River, near Port Essington. It is highly probable, however, that future prospecting will bring to light other occurrences of valuable minerals, as the extremely wet climate of the coast region, with the resultant rank growth of underbrush and heavy covering of moss, has deterred many from prospecting this part of the district with any degree of thoroughness. The mountains here, besides, are high and rugged, with few trails and less feed, so that the more open country and better climate of the interior has, up to the present, gained most of the attention.

Of the Cache Creek series little can be said; the rocks composing it are chiefly quartzites, dark highly-altered argillites and crystalline limestone, and are supposed to be carboniferous, though no fossils have been found in them in this region, and this classification must be regarded as only provisional. Their extent is very doubtful, and they do not appear to outcrop in the Skeena valley itself, at least as far up as Kispyox; the only locality in the lower part of the Skeena watershed where these rocks were noted being on the Kitsequecla River, a few miles above its mouth. On the Upper Skeena they appear to be more largely represented, as they crop continuously along the river from near the fourth telegraph cabin to the mouth of Bear River, and beyond. The writer is not aware of any claims having been located in these rocks.

The third of these divisions, the Porphyrite group, covers by far the most extensive area, and is also of most interest to mining men, inasmuch as practically all the recent discoveries of mineral occur in this formation, while the coal-measures may, for the present at least, be also included. These rocks are probably of cretaceous age, and vary greatly in composition and appearance throughout the district. While named by Dr. Dawson the "Porphyrite Group" on account of the preponderance of that rock in the Francois Lake district, to the south of the part in question at present; still rocks of volcanic origin are by no means the only ones represented, there apparently having been a gradual change from south to north from beds mainly of volcanic materials to those of purely aqueous deposition.

In and adjacent to the Bulkley valley these rocks cover a great area, and have been studied in more detail than elsewhere, having been prospected more or less thoroughly, and numerous claims located on them. Here volcanic rocks are much in evidence, consisting of porphyrites (andisites), tuffs, agglomerates, etc., often highly amygaloidal with inclusions of calcite, zeolites, epidote, etc., more often occurring in sheets as volcanic flows, but frequently showing evidences of deposition under water, and all more or less regularly bedded. They vary greatly in texture and appearance, in color ranging from light greenish greys to dark purplish reds. Dr. Dawson has estimated their thickness, south of Francois Lake, at about 10,000 feet, and while of necessity this will vary greatly, in the neighborhood of the Bulkley valley it will probably not fall far short of this.

These volcanics have been cut in various places by intrusive granitic areas, which have shattered and metamorphosed them to a great extent. It is along the contacts of these intrusive rocks and the numerous dikes from them with the porphyrites that mineralization has most frequently taken place. The granitic rocks themselves are somewhat variable in appearance, two distinct faces having been noted on the Telkwa River, one consisting of a coarse light colored biotite granite, shading off into a granite porphyry near its edges, and the other of a pinkish syenite porphyry; both, however, seem to have had the same effect in regard to mineralization. The dikes from them show an indefinite number of types.

In the vicinity of the Bulkley there would appear to be, so far as is now known, three main mineral-bearing belts, the most important so far being situated on the Telkwa River, near its head, crossing over into the headwaters of the Morice River. The other two have not been visited by the writer, but from description of prospectors and others conditions there must be very similar to

those on the Telkwa. One of these lies at the head of the Zymœtze or Copper River, including Hudson Bay Mountain, and the other is located on the Babine range, between the Bulkley and Babine Lake, near the headwaters of Driftwood Creek. These two latter districts differ from the first-named, inasmuch as a number of galena leads have been located in them, whereas on the Telkwa district that mineral is seldom seen.

On the Telkwa River the ores consist chiefly of copper, and occur in a variety of ways. At times they are found occupying fissures where the country rock has been shattered near the intrusive granite rocks; this is particularly noticeable in Hunter's basin, at the head of Goat Creek. Replacement along crushed zones is another common form of ore deposition, and again in places the later dikes themselves are mineralized, and in other cases, although the dikes appear to be barren, the porphyrites along their contacts are mineralized; one such case, that of the Black Jack and Dominion claims in Dominion basin, which came under the writer's notice, showed a strong dike about 45 feet wide, cutting nearly vertically the porphyrites, themselves dipping at low angles. The brown trap of the dike seemed to be quite barren, but in certain beds of the volcanics, which were more readily decomposed than others, the country rock had been replaced by quartz, calcite, epidote and ore, which alteration appears to have followed the bedding planes, reaching its maximum intensity near the walls of the dike and gradually decreasing laterally from them.

It will be seen from the above that uniformity in the manner of ore deposition is not to be looked for; probably the most common form is when the large dikes are themselves mineralized, especially along their walls. In such instances the adjacent porphyrites are in most cases themselves decomposed in part and more or less mineral-bearing.

Practically no work has been done on any of the Telkwa River properties beyond mere surface prospecting, and that to a very limited extent only, so that it is much too early to prophesy as to their continuity and ultimate value. In some of the small fissures high grade ore is found, with values chiefly in silver and copper (the gold contents as a rule being small), the ore consisting of a variable mixture of chalcopyrite, chalcocite, copper carbonates, bornite and specular iron, the latter at times being highly micaceous. This micaceous iron seems in places to be associated with silver, as a sample of it, carefully separated from the other materials, gave by assay 8 ounces of silver to the ton. The gangue is usually quartz. The following are a few of the most typical claims of this class, the Rainbow, King, Waresco, Idaho and Russell, all in Hunter's basin.

It is, however, mainly on the larger and lower grade properties that the future of the district depends; the most common ore in these is a mixture of chalcopyrite, a little chalcocite, specular iron and iron pyrites in a gangue consisting of quartz, altered country rock, epidote, calcite, etc., which should make a nearly self-fluxing ore. Among the principal claims of this description may be mentioned the Duchess group, the Evening group, and the Anna-Eva group, all on Howson Creek, and the Dominion and Black Jack claims of Dominion basin.

As a general rule it may be said that, although the greater part of this district is underlain by rocks of the Porphyrite group, no important discoveries of mineral have been made except in the immediate vicinity of the granitic intrusions and the dikes from them, and it would therefore appear conclusive that they were instrumental in the deposition of such ore as has so far been found.

Coal.

Coal has been reported from many widely separated localities in the Skeena watershed, in fact it was known and locations taken up some time before the existence of the metalliferous deposits were noted. To give an idea of the widespread distribution of coal, the following localities may be mentioned where it has been found: The lower part of the Telkwa River and its tributaries; the headwaters of the northern branches of the Morice River; the Bulkley River, from near its junction with the Morice River to the mouth of Sharp Creek, about twelve miles below Moricetown; Driftwood Creek; the Kitsequecla River, near its mouth; the lower end of the Kispyox River; Tzesatzakwa River; the head of Copper River, and near the head of the Skeena River itself.

In not all of these localities have workable seams been found, but it is of interest to note the presence of the coal-bearing rocks, with the possibility of future work showing up other and better seams in some places at least.

It seems probable that all these coals are at about the same geological horizon, and are of cretaceous age, though towards the south, tertiary coals may be represented contemporaneous with some of the volcanic flow rocks there found, which are in all probability younger than those of the Porphyrite series.

Besides being widely distributed throughout the district, coals differing greatly in quality have been found, as a glance at the following analyses will show:—

No.	Remarks.	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Ash.
1.	2 foot seam, Driftwood Creek, does not coke.	7.90	36.64	42.06	13.40
2.	2 foot seam, Bulkley River, near mouth of Sharp Creek, cokes well	1.02	25.70	52.96	20.32
3.	Top seam, 10 feet, Cassiar Coal Co., Goat C'k, non-coking; sulphur 0.52%	3.40	28.80	62.00	5.80
4.	6 foot seam, Transcontinental Exploration Syndicate, Goat Cr'k, non-coking, sulphur 0.52%	0.90	9.90	75.80	13.40
5.	6 foot seam, Western Development Co. head of Skeena River, non-coking	5.75	7.34	75.26	11.65
6.	4 foot seam, Telkwa Mining, Milling & Development Company, head of Morice River, non-coking ..	0.58	10.82	82.70	5.90

Of these coals Nos. 1 and 2 are not likely to be of much economic importance for some time, occurring, as they do, so close to others of better quality; No. 3 is typical of most of the coal on the lower Telkwa, and should make a most excellent fuel for steaming, while Nos. 4, 5 and 6 may be classed as semi-anthracites; they are all strong, bright coals, and should stand transportation well and may some day supply the greater part of the domestic fuel of the Pacific coast cities.

It is to be regretted that none of these coals make a good coke,* No. 2 being the only one that coked wel lin the laboratory, and it is too high in ash for commercial purposes. In view of the proximity of smelting ores, a good coking coal would be of great value, and it is to be hoped that further exploration will bring to light some suitable seams.

It will be seen from the above analyses that the condition of the coal differs widely at points comparatively near together, and it would appear that the proximity of areas of eruptive rocks younger than the coal-measures has been the chief factor in altering it from a lignitic coal to a semi-anthracite.

Among the better known localities, the Telkwa River field may be mentioned in more detail. Here the coal-bearing rocks overlie those of the Porphyrite group with probably a slight unconformity, but, as they have subsequently been much folded and disturbed, their relationship to one another is not entirely clear. The coal-measures are the highest horizon represented, being

[*Editor's Note.—We wish to take exception to this statement. The usual laboratory tests are not conclusive. Given the proper conditions of comminution and subsequent treatment, many so-called non-coking coals make excellent coke.]

themselves overlain by glacial debris. In a total thickness of not more than 300 feet of measures, four at least, good, workable seams have been uncovered; the intervening beds consisting of clay shales, often highly nodular, with much ironstone, a few beds of soft, crumbly sandstone towards the bottom, and finally a basal bed of coarse loosely-cemented conglomerate, composed chiefly of pebbles from the underlying volcanics.

These rocks must have originally covered a much more extensive area than at present, but their soft nature and consequent inability to resist erosion have resulted in detached remnants only remaining in the valleys. As the valleys are wide, and almost invariably heavily drift-covered, the coal is exposed only where the streams have, in a few places, cut through the deep mantle of gravel to the bed rock; elsewhere no natural exposures are to be found until the higher ridges are reached, consisting of volcanics, the actual contact being everywhere masked. The strata, in addition to this, are much flexed and very subject to faulting, so that it will be readily seen that the task of delimiting the areas and prospecting generally is one of extreme difficulty.

The very small thickness of rocks overlying the coal, and the fact that they are folded in a series of short, rather sharp flexures, and subsequently have been subject to denudation, has resulted at times in the formation of a number of small basins where the seams at no time gain any great depth. It might be possible in such cases to work the coal in a series of open cuts or by stripping the overlying gravel and shales in favorable localities.

Small faults are numerous, and the seams are likewise cut by a number of dikes, usually accompanied by faulting, from the nearby granitic areas.

In regard to the size of the individual seams, the following section was measured at the Cassiar Coal Company's property, on Goat Creek; this is the most complete section to be found anywhere in the district:—

		Feet.
Clay Shales		
	Coal with a few small clay partings	12.0
	Clean coal	7.7
Top Seam	Clay	2.0
	Gray sandy shale and covered, about	30.0
	Coal	1.5
	Clay shale	2.7
	Coal with a few irregular clay partings	14.5
Middle Seam	Shale with ironstone nodules	3.3
	Coal	2.0
	Gray clay shale with nodular ironstone bands, about	50.0
	Carbonaceous shale and coal	2.0
	Coal	1.5
Bottom Seam	Shale	0.5
	Coal with small irregular clay partings	9.0
	Clay shale	——

Several small seams overlie these. A short distance up the creek beyond these exposures the two upper large seams have been burned, leaving thin beds of slaggy material; the overlying clay shales are burned to a brick red, forming a very noticeable feature in the landscape where exposed in a high cut bank. The burnt area, however, does not appear to be of any great extent.

In the Transcontinental Syndicate's openings, a few miles higher up Goat Creek, five seams, 4 feet, 3 feet 3 inches, 4 feet, 6 feet, and 4 feet respectively in thickness were cut in about 130 feet of measures; while on the property of the Telkwa Mining, Milling & Development Company, on the head of the Morice River, at least four seams of the following thicknesses, 4 feet 2 inches, 4½ feet, 4 feet, and 7 feet 3 inches, have been stripped.

Practically all the coal land in this vicinity is controlled by four companies, the three above mentioned and the Kitamat Development Company.

On the Bulkley River, from a short distance above Moricetown to Sharp Creek (about 12 miles), coal outcrops at intervals, but no workable seams have as yet been uncovered. At Sharp Creek nine small seams were stripped, varying from 15 to 40 inches thick, but they all proved too high in ash to be of value (an analysis of one of these is given above).

Near the head of the Skeena, about 150 miles north of Hazelton, another important coal field is situated, which has been prospected in some detail by the Western Development Company, who control about sixteen square miles of coal lands here. In this field the coal measures occur near the top of a great thickness of sedimentary rocks, which probably represent the porphyrites to the south. The rocks here are not so highly disturbed, and there is apparently a greater thickness of overlying strata than at the Telkwa areas. The coal-bearing rocks occupy the trough of a syncline, with gentle dips on either side, the Skeena cutting diagonally across it. At the southern edge of the basin, however, the strata are much more disturbed, being often tilted at high angles. At least one seam of good coal, from 5½ to 6 feet thick, has been opened up at several places, an analysis of which has already been quoted; other smaller seams are known to exist, and it is quite possible that the larger one does not represent all the workable coal in this area. The physical qualities of this coal are all that could be desired. It is extremely hard, resists weathering well, and is bright and lustrous in appearance. Although no recent volcanic rocks are known of in this neighborhood, still evidences of volcanic action are not wanting, as the rocks of the coal measures and the coal itself are found in places to be cut by small quartz veins, sometimes more or less mineralized with iron pyrites.

In most of the other coal districts mentioned no workable seams have as yet been found, the coal being either too thin or too highly disturbed to be economically worked. Taking into consideration, however, the difficulties of prospecting already alluded to, there is no reason to suppose that larger and more favorably situated seams do not exist, at least in some of the localities in question.

Although placer miners were the first to prospect the Skeena country, the results so far have not been encouraging, Lorne Creek being to-day about the only producing locality. This creek has afforded annually a small output of gold since about 1884.

The Omineca country, to the east, and reached via the Skeena and Hazelton, has long been a producer of placer gold. The old diggings are now nearly all abandoned to Chinamen, but there is sai to be a large amount of ground there which can be profitably hydraulicked when transportation facilities have been improved and the cost of working lessened correspondingly. The presence of argentiferous galena in that district has also been known for some years, as well as that somewhat rare mineral, arquerite, a native amalgam of silver, which has been found in the creek gravels.

In the neighborhood of Kitsalas Canon, a number of quartz claims holding gold and copper have been located, but the writer is ignorant as to the conditions prevailing there.

In conclusion, it may be said that lack of transportation facilities has prevented the exploitation of a country rich in possibilities, and until the advent of the railway nothing can be done to open up and develop its latest resources. The present means of communication are highly unsatisfactory, Hazelton, the distributing point, being reached either by pack trail, 400 miles from Quesnel on the Cariboo road, or by river steamer from Port Essington, and as the Skeena is navigable only at certain stages, and then only with difficulty, this route cannot always be depended on. Away from the river, trails are few and bad, and much trail and bridge building will have to be done before even the best known camps are made easily accessible.

The pyroxene group of minerals, found in metamorphic and igneous rocks, are silicates of magnesia with variable proportions of iron, lime and aluminia. In this group are angite, enstatite, diapside and hypersthene.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

The heavy storms occurring at intervals during February interfered, to a considerable extent, with shipments for the month. Notwithstanding, a majority of the larger collieries show increases when compared with the corresponding month of 1906. The Inverness Railway & Coal Company, the Nova Scotia Steel & Coal Company, the Intercolonial Coal Company show substantial increases. The Cumberland Railway & Coal Company, owing to an outbreak of damp, has fallen badly behind in shipments for the past two months; so far behind, indeed, that it will take good work for many future weeks to effect a recovery.

Everyone connected with the coal trade is in good cheer. Prospects never were brighter. The Dominion Coal Company alone has sold close on 1,300,000 tons in Montreal, and an additional hundred thousand or two more could readily have been sold, had the company considered it was in a position to fill the quantity. The Dominion Coal Company are figuring on an increase of half a million tons for 1907. Last year the Intercolonial Coal Company beat all of its former records, and it looks as if the management was determined to make a still better record this year. The quantity shipped last year, 280,000 tons, may not strike the ordinary reader as calling for special comment, but the figures are remarkable when it is considered that the colliery is some two score years old, that its slope is about a mile and a half long, on a pitch of twenty-two, and that the face of the level is a mile or more from the bottom of the slope. It is merry hoisting to bring 1,200 or more boxes along a level and up a slope the long distance specified.

The Province is in excellent cheer over the continued prosperity of the provincial coal trade, and the Premier gave voice to this in bringing down his budget the other day. Royalty on coal is the chief item of revenue of the Province. Last year the revenue from the Mines Department was $642,000, mostly from coal. The revenue from all sources was $1,300,000. Premier Murray predicts that in eight years the royalty from coal alone will equal the total revenue of the Province for 1906. In view of these things, Nova Scotians may well be proud of their mineral heritage.

It is generally believed, down this way, that matters looking to a settlement of the Steel-Coal difficulty are progressing satisfactorily, and that a definite arrangement is only a matter of time—a few weeks—perhaps. But a settlement does not mean that the Steel Company will abandon efforts to secure an adequate supply of fuel from its own mines. When the furore was at its height reports were current that the Steel Company had acquired options on territory at Langan, Port Morien, etc. Those in the ken shook their heads and muttered, "this will not do." There were other larger and better areas left out of count, and until the Steel Company sought and obtained options on these they were not in earnest in the matter. That they were in earnest is now made clear by the Steel Company securing options on the Burchell areas at Point Aconi. It is claimed that in these areas there are hundreds of millions of tons. I am content to put the available quantity at seventy-five millions. The areas are submarine, and in order to have easy access to the outlying areas it is necessary to go through an area owned by the Dominion Coal Company. The Government evidently favors granting permission to the Steel Company, as a bill dealing fully with the matter of an entrance to submarine areas has been brought in. A striking feature of the bill is that the Government are the sole judges as to the damages to be allowed the holders of the areas through which an entrance is effected. This bill, however, does not dispose satisfactorily of the whole question of submarine areas. It is this way. A dozen or more years ago few people attached much value to the areas under water. For instance, the General Mining Association when in operation—though they could have acquired miles seaward—were content with taking up one mile only out from shore. Similarly, the Dominion Coal Company did not see the wisdom of extending their areas at Table Head (Dom. No. 2) more than a mile and a half seaward. At that time it was either considered that the coal did not extend far seaward, or that it could not be profitably mined for more than a mile or two beyond the high water mark. Opinions since then have changed, and it is now believed that mining can be prosecuted under water almost indefinitely. The Nova Scotia Steel & Coal Company took it into its head that it would take up some sea areas in front of the Dominion Coal Company at Table Head, and did so, securing many miles. Then the Dominion Coal Company thought it would pay back in kind, so stalked over to Point Aconi and took out many areas in front of the Nova Scotia Steel Company, and so we have the spectacle of the Steel Company property in front of the Coal Company and preventing extensions seaward, and a similar thing in the case of the Coal Company. There are other companies besides these two which are in similar awkward predicaments. It is suggested that a commission be appointed for the purpose of effecting an amicable exchange of submarine areas, the Dominion Coal Company, for instance, abandoning the areas at Point Aconi, and the Nova Scotia Steel & Coal Company abandoning in turn those at Table Head, the one for the other.

The Miner's Union has made a demand on the Government for the enactment of an eight-hour day, weekly pays, certificates for iron ore miners, and old-age pensions. The Government will be unable to see its way to comply with either of the three first named, but will appoint a commission to enquire into the schemes of old-age pensions in other lands.

It is reported that the Nova Scotia Steel & Coal Company have acquired options on what are held to be extensive iron ore areas at Arisaig, N.S. It is freely predicted that from this out the iron ore trade of Nova Scotia, which has shown little activity for years, will take on vigorous new life. The talk generally is optimistic. Included in this talk is the re-opening of the unlucky Broughton Colliery. It is said a further large sum of money has been obtained in Britain whereby to purchase an area of the Dominion Coal Company which stood in the way of economical developments, and to complete new plans for successfully operating the colliery.

NOVA SCOTIA GOLD MINES.

Moose River District.—The Consolidated Mines Company of Canada, capitalized at $5,000,000, has been organized to work the amalgamated properties of the G. & K. Mining Company and the Moose River Mining Company. The G. & K. property now has a forty-stamp mill and it is proposed to enlarge this. At present, attention is being devoted to getting a summer's supply of wood, and not much mining is being done. New boilers will shortly be installed, also an air compressor, as they are now getting their air from the Tourquoy Mining Company, which has a water-driven compressor. The company also contemplates developing water power at Scraggy Lake and transmitting it electrically over to the mine.

The Tourquoy Gold Mining Company, under the management of Mr. Robert Kaulback, has been successful in again finding the pay chute in No. 3 belt, which they lost a little more than a year ago. The Britannia belt is also showing good values. The company's dam has been repaired, and sufficient wood has been hauled out to last the summer. There is about 150 tons of ore now in the mine ready to be crushed.

Upper Seal Harbour.—The Dolliver Mountain Mining Company are contemplating the transmission of electrical power from their power plant to outlying mines in Isaac's Harbour.

The Beaver Hat Gold Mining Company, in the same district, are still operating their five-stamp mill.

Cariboo District.—Mr. L. W. Getchell is working the Dixon property. About sixty tons of ore per month are being mined, and, as there is no stamp mill on the property, the ore is hauled to the Baltimore & Nova Scotia Company's mill for treatment. Mr. Fred. Darragh is in charge during Mr. Getchell's absence in the States. A large supply of cordwood has been secured, and a good summer's campaign is expected.

COBALT.

Mr. Rochester, of the Cobalt Lake Mining Company, who was in Ottawa last week, has returned.



A 4-INCH VEIN OF COBALT ORE AT THE EVANS MINE.

Mr. and Mrs. Adler, of the Foster Mining Company, have moved into their new house at the mine.

Mr. J. W. Evans, mining engineer of Cobalt, has taken Mr. J. T. Laidlaw, mining engineer of East Kootenay, B.C., into partnership. The firm will be Evans & Laidlaw, with offices at Larder Lake, Toronto and Cobalt.

Mr. Longwell, of the Coniagas, who has been in New York looking after the company's ore shipments, has returned to town.

Mr. R. W. Leonard, president of the Coniagas, is in town.

Mr. Culbert, of the O'Brien, has left on an extended trip to Mexico.

The McKinley-Darragh-Savage Mining Company have about completed their stamp mill and concentrating plant, and this plant should prove very successful in treating the low grade ores.

The Nipissing Mining Company are pushing the work of development on their veins underground, and have a large quantity of ore blocked out.

The Jack Pot Silver Mining Company have placed an order with the Allis-Chalmers-Bullock Company for a 20 horse-power boiler and hoist, and are opening up their vein adjoining the Nancy-Helen Mine.

At the O'Brien Mine, Manager Culbert is pushing the work on the company's new office and putting in extensive water works for domestic use and fire protection.

The Imperial Cobalt Silver Mining Company, operating near Portage Bay, are installing a three-drill air compressor, a 60 horse-power boiler, and are at present busy erecting a new boiler house. The management expect to have three drills working underground by the end of the month.

The Cobalt Lake Mining Company are getting out some very fine silver ore, and have a quantity already sacked in their ore house which assays $3,000 per ton in silver. Their new boilers and machinery are on the way, and Mr. Fraleck, the company's engineer, is getting the foundations prepared and rushing the work of installation. The shaft on vein No. 4 has been sunk to a depth of thirty feet, and the vein shows an average width of nine inches. Five inches of this is niccolite, containing wire silver, and four inches of it calcite, argentite and wire silver, and assays from three to six thousand ounces of silver per ton. On No. 2 vein an open cut is being driven into the bluff, and of five feet. No. 3 vein is solid nicollite from 12 inches to 15 inches in width, and, so far as known, is the largest vein of massive niccolite in the world. So far all of the six veins yet discovered on this property are of practically right angles to the lake, and continue, so far as known, under the lake. Soundings have been taken over three-quarters of the lake, which disclose a clay bottom of from twenty to forty feet think. This insures the dryness of the shafts and drifts under the lake, and makes the conditions of mining on this property similar to that of the other mines in camp.

Larder Lake is still attracting the attention of the prospector and investor, and many rich samples have been brought down from this interesting district. It will be two months yet before intelligent examinations can be made and any idea arrived at as to the value of the claims already found. One good gold mine would be the making of Larder Lake, but as nine out of every ten claims have been staked on chance, in a depth of snow from two to three feet, little development work has been done as yet.

Numbers of men, with loads of supplies, are going there every day from all parts of the country, and it won't be for want of enterprise or careful prospecting if Larder Lake district does not show up well is summer.

Numerous finds of native silver have been reported to the west of Cobalt. Several finds have been made near Lady Evelyn Lake, and some rich samples have been brought down from them. Native silver is also reported to have been found in James township. This is very significant and shows the silver-bearing area much more extensive than was at first supposed. From a few miles square the area has now expanded to twenty-four miles by about ten miles, or 240 square miles.



SHAFT HOUSE—THE EVANS MINE, NEAR PORTAGE BAY, COBALT DISTRICT.

It is anticipated that more prospecting will be done this summer than any previous year in Cobalt camp.

THE PROSPECTUS OF THE TRUTHFUL JAMES MINING COMPANY.

The directors of this company expect to make ten times their money out of the public, as they do not contemplate putting their own hard-earned money into any mining enterprise. So far the company has two mining properties, for which they paid a total of $130.

Property No. 1 cost them $100, and property No. 2 $30, besides two bottles of whiskey for the embarassed prospector from whom they bought the claims. Already about $37 worth of work has been done on property No. 1, at an expenditure of $480. The directors have also paid $5 to the mining expert for his report, and have promised to print 5,000 copies of the prospectus as an advertisement for him.

No veins have as yet been discovered on the property, but one fine wall has been found to which a small stringer of smaltite was attached, which one mining expert pronounced calcite, and which, he said, would undoubtedly lead to rich silver values at depth. The property is only 6,559 feet 3¼ inches from the Woolly Wonder Mine, whose vein our expert has traced over on our property.

The company has spared no expense in securing the services of Mr. Lieswell, the mining expert, who graduated with honors at Fakerourg in 1837, and who has had 102 years and 3 months' experience in this branch of mining.

We quote the following from our expert's report: "The country rock is a greenish grey calcareous peroxidite, heavily mineralized with hornaceous, schmisatic magaphone granite, and is cut by violent intrusions of pink felsnapthic andorite, with rhyolusic inclusions. This gives an abundance of contacts in the property, which will increase in value as they go down. Only one contact is still lacking, and your directors must arrange for that."

In conclusion, our expert states: "This is undoubtedly the finest property I have seen in camp."

We want it clearly understood that we are not responsible for any statements made by our expert; also that none of the directors are putting any of their money into the enterprise, but are relying on the public's money entirely to make it a success.

BRUCE MINES DISTRICT.

Considerable activity is now apparent in the copper mining industry in this neighborhood. During the past few years mining in the district has been in a state of stagnation, but signs are not wanting that a welcome revival has set in. In the past the principal obstacle with which mine owners have had to contend has been the lack of facilities for treating their output on the spot, and the cost of shipping ore to any of the existing smelters in Canada or the United States has proved a considerable handicap to the smaller producers. The prospect, therefore, of custom smelters being erected during the current year at Sault Ste. Marie and Bruce Mines, has given a decided flip to the industry, and renewed enegy is evident on most of the properties in the locality. The Bruce Mines were, last year, opened up again, and are now being actively worked with English capital. Operations have been commenced on the Campbell Mine. The Superior Mine, on the Algoma Central Railway, the Northern Ontario Company's property, and the Jury at Dean Lake are being rapidly brought to the producing stage, while negotiations are pending for the opening up of several other rich prospects. An important factor in the success of this district will be the extension of the Bruce Mines & Algoma Railway to the north. At present only eighteen miles of this road have been constructed, viz., from Bruce Mines to Rock Lake. An option has recently been taken, and if, as is projected, the line is pushed on to join the Canadian Pacific Railway's main line, a large tract of rich mineral country, hitherto unexplored, will be opened up. There is abundant evidence that the possibilities of this part of Algoma are becoming apparent to the mining capitalist, and, with the recent influx of English and American capital and the undoubted mineral wealth of the country, everything points to its rapid development into one of the chief copper producing centres of Canada.

The Copper Mining & Smelting Company are preparing to set their concentrating mill at Bruce Mines in motion this spring. Various additions have had to be made, owing to the sale by the former owners of a portion of the machinery, and an order has been placed with the Jenckes Machine Company, of Sherbrooke, for the supply of a 300 horse-power cross compound Corliss engine, a 75 horse-power slide valve engine for the crushers, and a 40 horse-power engine for hoisting purposes. Satisfactory progress is being made in the production of ore, and the company has now nine drills at work on stoping and development.

ALBERTA.

Last year sixteen new mines were opened in Alberta. Sixty-four are now working. The expenditure through the coal mines department was $4,500.

It is understood that no more coal lands are to be sold by the Dominion Government. The Government intends holding the lands and leasing them on twenty-one-year leases, at an annual rental of one dollar per acre. No leases are to be issued for less than 2,500 acres, so that, paying this minimum amount rental, a company will have every incentive to early development of its holdings.

BRITISH COLUMBIA.

A. J. Bible was killed at Le Roi Mine, on March 16th, while loosening frozen ore at a dump.

Mr. Thomas Kiddri, well known as a smelter-man, left recently for Prince of Wales Island to superintend construction there.

Much feeling has generated in British Columbia by the recent enforcement of the Lord's Day Observance Act.

The Maple Leaf Mine, in Franklin Camp, B.C., has been sold to Grand Forks and Vancouver parties. Its capitalization is fixed at $250,000.

MEN AND MATTERS.

On March 9th George Thompson, shift boss at the Trethewey mine, was killed by an explosion of dynamite.

It is stated that options have been secured on the Richardson zinc ore lands in Frontenac county, Ont., and that a smelting and refining plant will be erected in Kingston.

Mr. J. B. Woodworth, formerly manager of the Nova Scotia & Silver Cliff properties, in company with Mr. H. V. Somerville, an English mining engineer, has gone to Mexico for a month.

From Point Aconi, Cape Breton, come reports of progress being made by the Dominion Steel Company in boring for coal in the Burchell areas. The Steel Company has bonded about five hundred acres on the eastern side of Little Bras D'or.

The Edmonton Standard Coal Company, of Edmonton, Alberta, has taken over the Brenton and Parkdale mines.

Shipments of silver-lead ore from the district of Slocan, B.C., increased from 457 tons in December to 509 tons in January.

Legislation has been promised to straighten out the existing unsatisfactory state of the coal and oil licenses in Southeast Kootenay, B.C.

The old Pictou, N.S., copper smelter is to be put in commission again. It has lain idle for some years. The capacity of the furnace is 75 tons of ore per day. The copper ore bodies of Pictou county are yet undeveloped.

PERIODICALS.

The *Mining World* for March 9th begins a new department, "Corporation Affairs and Finances." The issue of March 16th gives a highly instructive article by Dr. R. S. Moss on "The Manufacture of Coke from Western Coal."

The *Mining and Scientific Press* of March 7th contains a well-illustrated and carefully-written article on "Deep Mining in the Lake Superior Region." In an editorial, the *Press* sounds a warning note about Larder Lake.

A description of the "Gold Prince Stamp Mill and Mine," of Animas Forks, Colo., is a leading feature of *Mines and Minerals* for March.

The *Mining Reporter* for February 28th contains a very useful article, "Some Sampling Results," which deals fully with the question of sampling gold reefs.

A very timely description of "The Revival of the Mining Industry in Cornwall" is a special feature of the *Engineering and Mining Journal* of March 9th. Prominent in the issue of March 16th is an outline of works on "The Low Grade Copper Deposits at Ely, Nevada."

The Colliery Guardian, London, England, in an editorial on

Professor Lapworth's estimate of Great Britain's coal reserves, remarks that "the visible coal fields, in fact, sink into insignificance in comparison with those which lie buried."

In the London, England, *Iron and Coal Trades Review* of February 22nd is a paper on "Fly-wheel Storage Systems."

The February number of the *Chemical Engineer* gives an interesting acount of a peculiar boiler deposit. The first of a series of articles in the electro-chemical problem of the fixation of nitrogen also appears in this number.

The *Canadian Electrical News* presents a very clear paper on "Meter Testing," by Mr. Oliver J. Bushnell.

Hardware and Metal for March 16th has been received. Among other matters, we find a valuable summary of Canadian metal markets.

Other publications received are:—Proceedings of the Cleveland (England) Institution of Engineers, the *Weekly South African Miner*, Bulletin No. 29 of the Institute of Mining and Metallurgy, London; Report of the Ontario Bureau of Mines for 1906, *The British Columbia Mining Exchange*.

The *Maritime Mining Record* of March 13th gives a very complete summary of news and movements in Nova Scotian coal fields.

CATALOGUES AND OTHER PUBLICATIONS RECEIVED

Messrs. Sinclair and Smith, surveyors and engineers, of New Liskeard, Ont., have issued a timely map of Larder Lake district.

THE JOURNAL is indebted to Mr. Harold P. Davis, of Silsby & Davis, New York, for a large blue-print of Coleman township, showing location of mines, etc.

Mussens Limited, of Montreal, Que., are sending out their catalogue, No. 11, which contains descriptions and illustrations of various types of metallurgical machinery. Among the stamp mill supplies we note particularly the Improved Homestake Mortar and the Blanton Self-Tightening Cam.

A folder entitled "Mine-A-Phone" describes the mine telephones manufactured by the Stromburg-Carlson Telephone Manufacturing Company, of Rochester and Chicago.

The Balanced Cable Crane Company, of 135 William street, N.Y., are circulating a fully illustrated catalogue describing their Balanced Cable Crane. They make several strong claims for their crane, among which are the absence of shock and the simultaneous use of any number of motor cars.

A leaflet showing the Campbell Gas Engine and Suction Gas Plant, manufactured in Halifax, England, has been received from the Canadian agents, the Producer Gas Company, of 11 Front street east, Toronto, Ont.

Catalogue No. 10, issued by Mussens Limited, of Montreal, P.Q., contains a list of mine supplies.

In view of the promised development of coal mining in the west, and the increased demand in the East, a catalogue received from the Jeffries Company, of Columbus, Ohio, is of especial interest. That company's devices for loading, unloading and for the general handling of coal and ashes, are admirably modern and complete.

The Allis-Chalmers Company are distributing as a March leaflet a description of their direct current motors and generators, type "K."

Bulletin 142 of the Sturtevant Engineering Series, published by the B. F. Sturtevant Company, of Hyde Park, Mass., illustrates thoroughly their generating sets with compound engines, Class V. C. 6.

DIVIDENDS

The Granby Consolidated Copper Company declared a quarterly dividend of 2 per cent. on March 30th. The dividend amounted to $405,000.

A dividend of $28,000 was declared on February 1st by the International Coal & Coke Company, of Coleman, Alberta.

The following companies have declared dividends, payable at the dates and for the total amounts specified:—

Dominion Coal—April 1st, $150,000.

Nova Scotia Steel—April 15th, $74,555.

Trethewey—March 15th, $40,000.

The Bunker Hill & Sullivan Mining & Concentrating Company, B.C., has just paid a dividend amounting to $180,000. This makes a total, since January 1st of this year of $360,000.

CANADIAN PATENTS

(Obtained through courtesy of Fetherstonhaugh & Company, patent lawyers, Toronto.)

February 26.—103,776, F. C. Loring, Eastport, Me., hydrocarbon burners; 103,788, H. A. Johnston, Toronto, Ont., internal combustion engines; 103,801, J. C. Davis, Hinsdale, Ill., process of making castings; 103,831, R. Sugfried, Pittsburg, Pa., flexible connection for gearless motors, Canadian Westinghouse Company, Limited.

March 13.—103,884, G. R. Prowse, Montreal, Que., apparatus for generating and superheating steam; 103,899, F. Von Engelgen & G. O. Seward, Holcomb's Rock, Va., processes of decarbonizing; 103,936, A. Pederson, Cleveland, Ohio, electrically operated portable drills, the Van-Dover Elliott Electric Company.

MARKET REPORTS

LONDON.—Week ending March 9th.—Enquiry for refined copper is far beyond capacity of the suppliers. Electrolyitic sells at £118 to £120 net.

Tin.—Operations in tin are quiet. English ingot tin is easy at £195.

Lead is advancing, and a further rise is expected. It is quoted at £20 5s.

Spelter is steady at £26.

Iron and Steel—The market is slightly flat. Pig iron is quoted at 54s. 10d. for Cleveland iron.

Antimony—£98 to £102.

Quicksilver—£7 per bottle.

Silver—31¾d. spot and 31⅝d. forward.

NEW YORK, March 13th—

Lake Copper—Per lb., 26 cents.

Electrolytic Copper—Per lb., 25½ cents.

Silver—Per ounce, 68⅜ cents.

Tin—Per lb., 42¼ cents.

Lead—Per lb., 6 cents.

Spelter—Per lb., 6 9-10 cents.

TORONTO, March 15th—

Pige Iron—Market in good condition. Radnor (charcoal), $33; Londonderry, $26; Middlesborough No. 1, $23.50.

Tin—Steady at 45 cents for ingots.

Copper—Sheet, $35 per 100 lbs.; ingot, $27 per 100 lbs.

Lead—Bar, $5.75 to $6; sheet, $7.

Zinc—Foreign, 7½ cents per lb.; domestic, 7 cents per lb.

Antimony—Market strong at 27 cents per lb.

TAILINGS

In nature, cobalt is principally found in combination with arsenic and sulphur.

The residue from the roasting of cobalt ores is caller safflor, and is often met with in commerce.

Scribbling paper dipped in melted paraffine wax may be used for indicator drops, instead of porcelain tiles.

Sea water contains ont only silver, but gold. The latter metal is present to the extent of about five milligrams to the ton.

Aluminium is much more sonorous than most other metals. Iron and silicon are the chief impurities of commercial aluminium.

The mineral resources of Quebec, only partially developed as yet, include gold, silver, asbestos, mica, chromite, magnetite and feldspar.

A solution containing as little as 0.015 per cent. of cobalt will give a distinct blue color when boiled with strong hydrochloric acid.

Ankerite, or lime-magnesia-iron carbonate, carrying small percentages of manganese carbonate, is mined in Nova Scotia. It is used instead of limestone as a flux in blast furnaces.

Nickel is much more easily reduced than cobalt. Nickel melts more easily. Cobalt fuses at a temperature only a little lower than that at which iron does. In general, cobalt resembles iron; and nickel resembles copper. Both nickel and cobalt have magnetic properties.

The "rescue chamber" is a safety provision of some of the large Austrian mines. It is a strongly-timbered retreat, and its single entrance has a door that can be made tight against air and water by means of rubber fittings. It has three cylinders of oxygen, sufficient to enable thirty men to breathe three days. Inhalation gear is at hand for parties leaving the chamber for reconnaissance or signalling, and canned foot, mediciens and first aid appliances are also kept in the place. The standard room will accommodate 24 men for a reasonable time for rescue.

The world's platinum is mostly supplied by Russia, but the production has not been keeping pace with the rapidly increasing demand. In consequence the value has nearly quadrupled in fifteen years, having advanced to $21.00 a nounce—or more than gold—early in 1905, and quite recently to $34.00 an ounce. Search for new sources of supply has been made, especially in the United States. This has shown that platinum exists in fifteen counties in California, 9 in Oregon, 8 in Idaho, 4 in Colorado, 3 in Washington, 2 in Montana, and one county each in Utah, Arizona and Wyoming. Profitable mining seems to be promised in Southern Oregon and Northern California.

"THE UNDEVELOPED MINERAL RESOURCES OF CANADA"

We regret that some rather inexcusable typographical and other errors, not noticed in the hurry and bustle of bringing out a first issue, appear in our last number. In the case of the abstract of Dr. F. D. Adams' paper on the above subject these errors are of a very glaring nature, and in justice to the author we desire to call attention to them.

1. On the ninth line from the beginning of the article it is stated that "in the last twenty years the mineral output had increased from a valuation of *the* million dollars per annum." This should read "a valuation of *ten* million dollars."

2. Page 14, ten lines from the top of the first column: "Although the area of the *trap rock* in Nova Scotia is comparatively small." This should be: "Although the area of rocks of carboniferous age in Nova Scotia is small as compared," etc.

3. Eighteen lines from the top of the first column of page 14: "And this represented a very small section of the undeveloped coal resources of *Cape Breton*." "Cape Breton" should be *Nova Scotia*."

4. Twenty lines from the top of the first column of page 14: "In New Brunswick there is a great distribution of the carboniferous system, but the coal *fields* are thin." It should read: "But the coal *seams* are thin."

5. Five lines lower down: "Again, all along the southern side of the Bay of Chaleurs are *undeveloped coal fields*." This should be: "Are *rocks of carboniferous age*."

6. Last line of column 1, page 14: "Riviere du Loup en *nant*." This should be "*haut*."

7. Eleven lines from the top of column 2, page 14: "Crossing the plains fine gold is found in the *lands* of the Saskatchewan River." This should be "*sands*."

8. Page 15, eighteen lines from the top of column 1: "We find there are fields of Huronian rocks *extending* into Michigan and Minnesota." This should be: "In the States of Michigan and Minnesota."

9. About the middle of the same column: "While south of Georgian Bay iron also occurs." This should read: "About the southern extremity of Hudson Bay."

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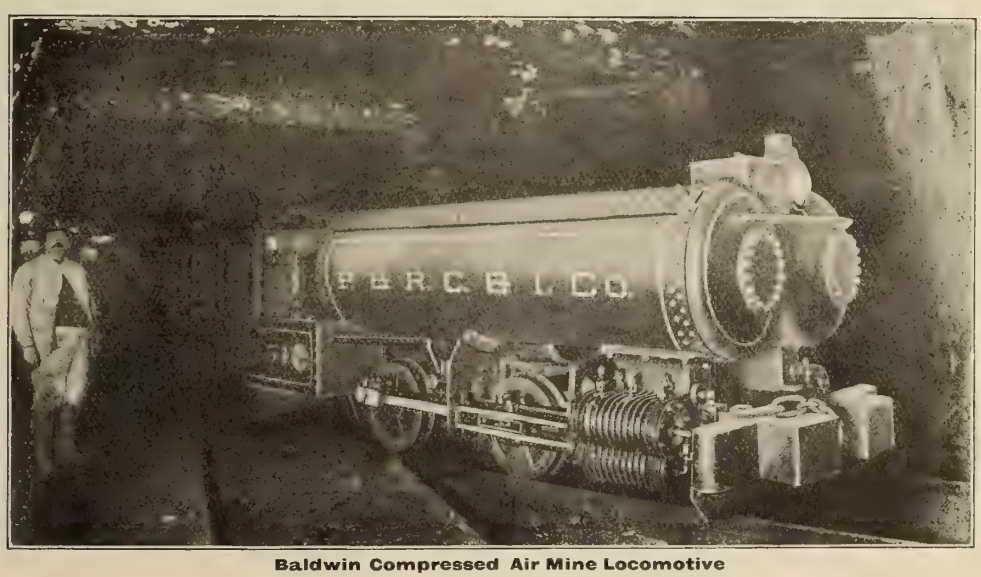
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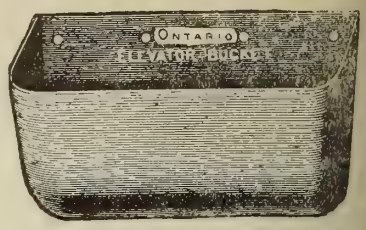
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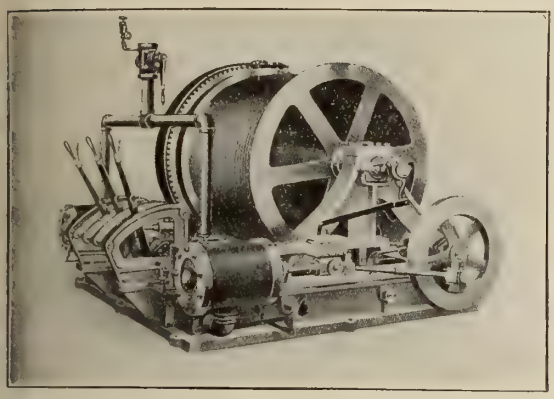
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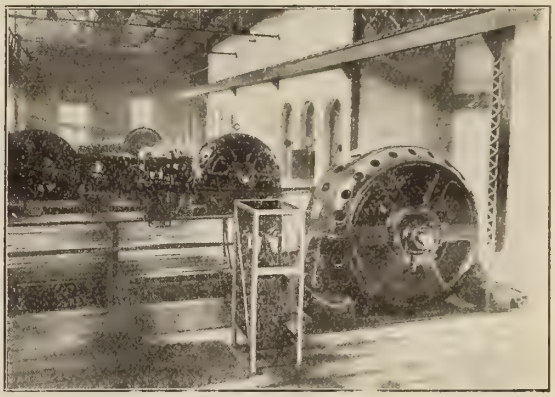
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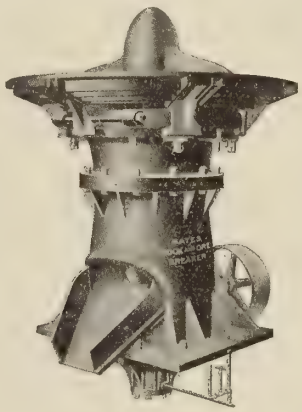
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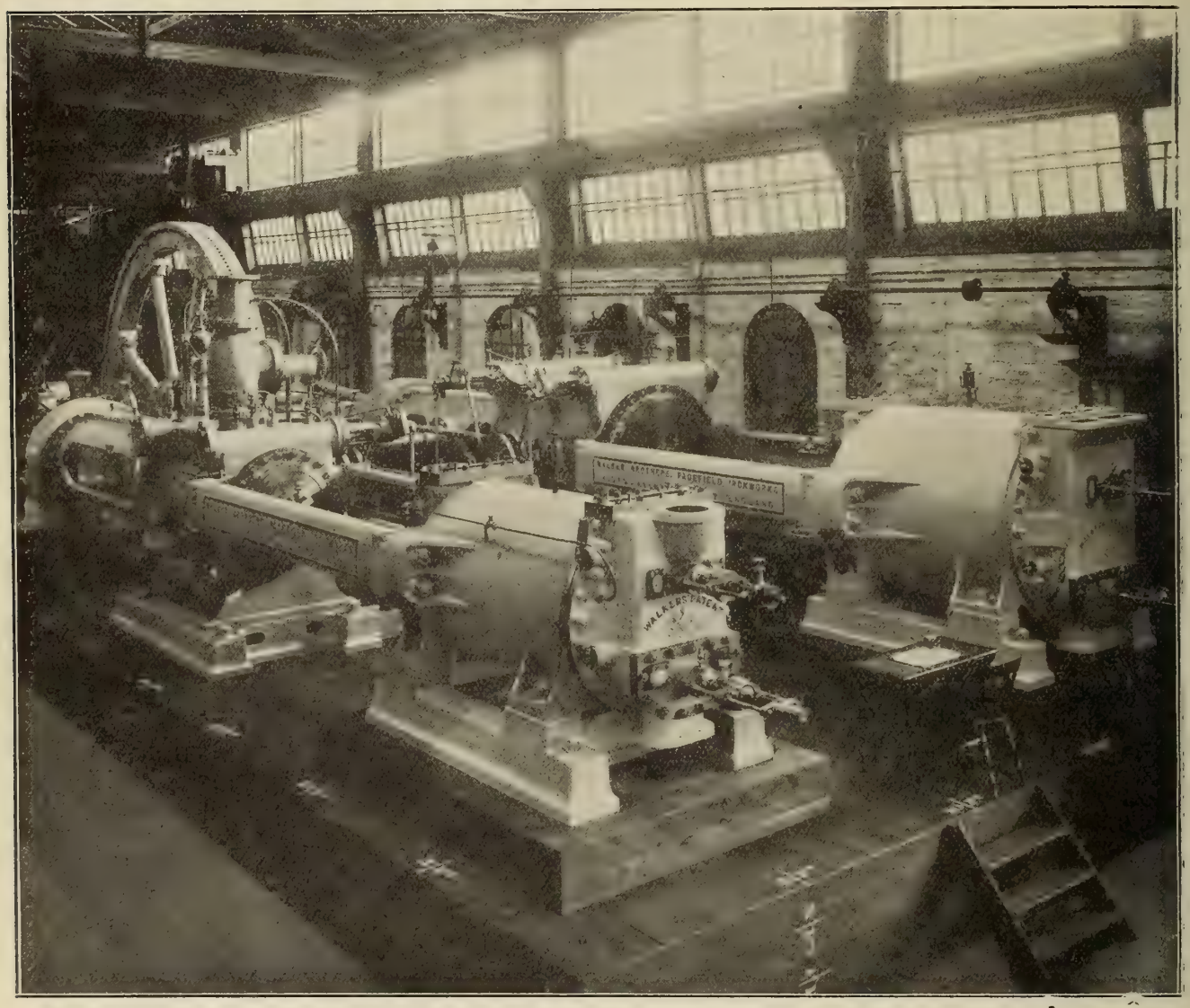
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(B) The establishment of a central reference library and a headquarters for the purpose of this organization.

(C) To take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada.

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PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.
Vol. II, 1899, 285 pp., bound red cloth.
Vol. III, 1900, 270 pp., bound red cloth.
Vol. IV, 1901, 333 pp., bound.
Vol. V, 1902, 700 pp., bound.
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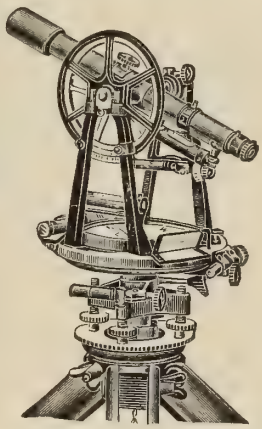
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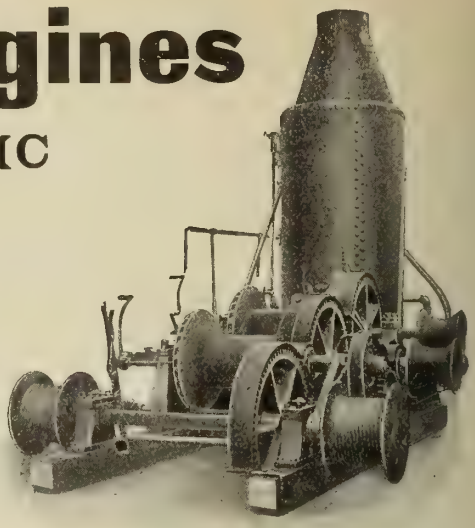
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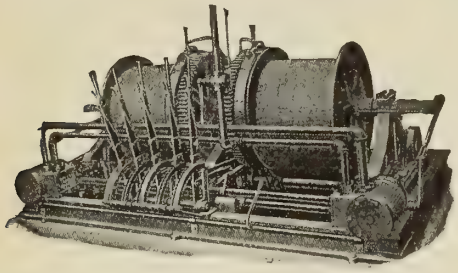
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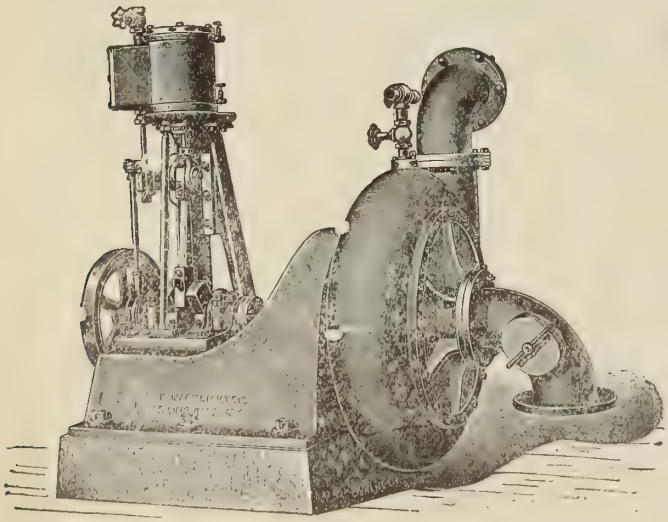
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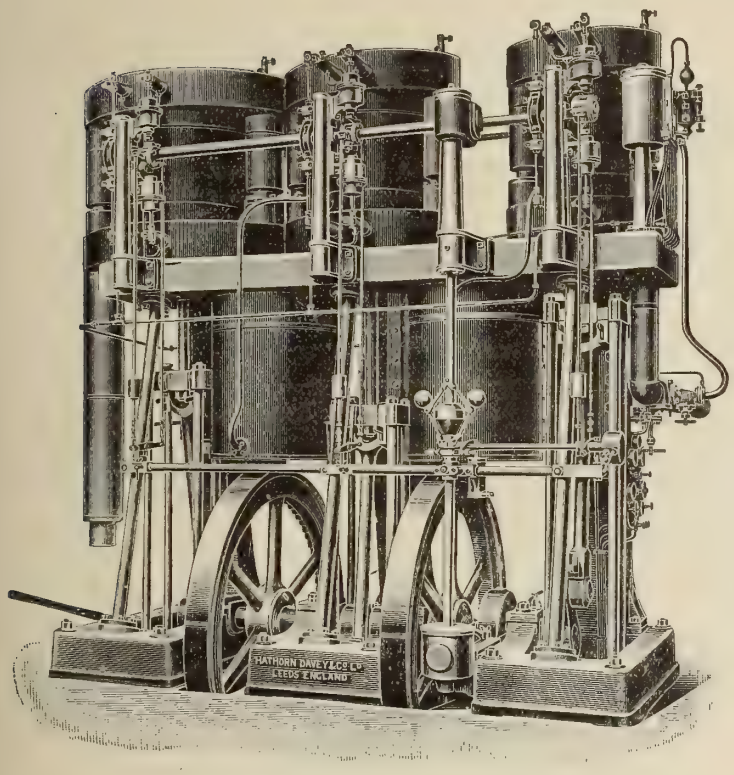
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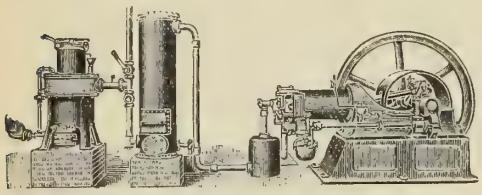
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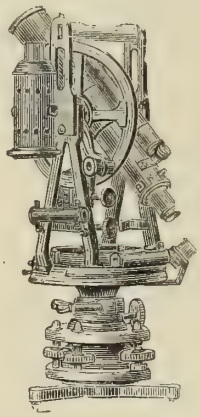
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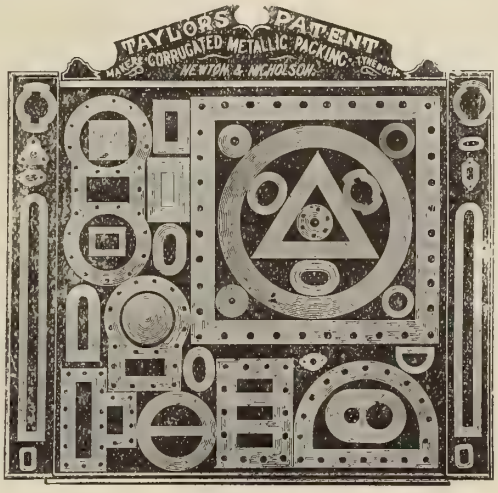
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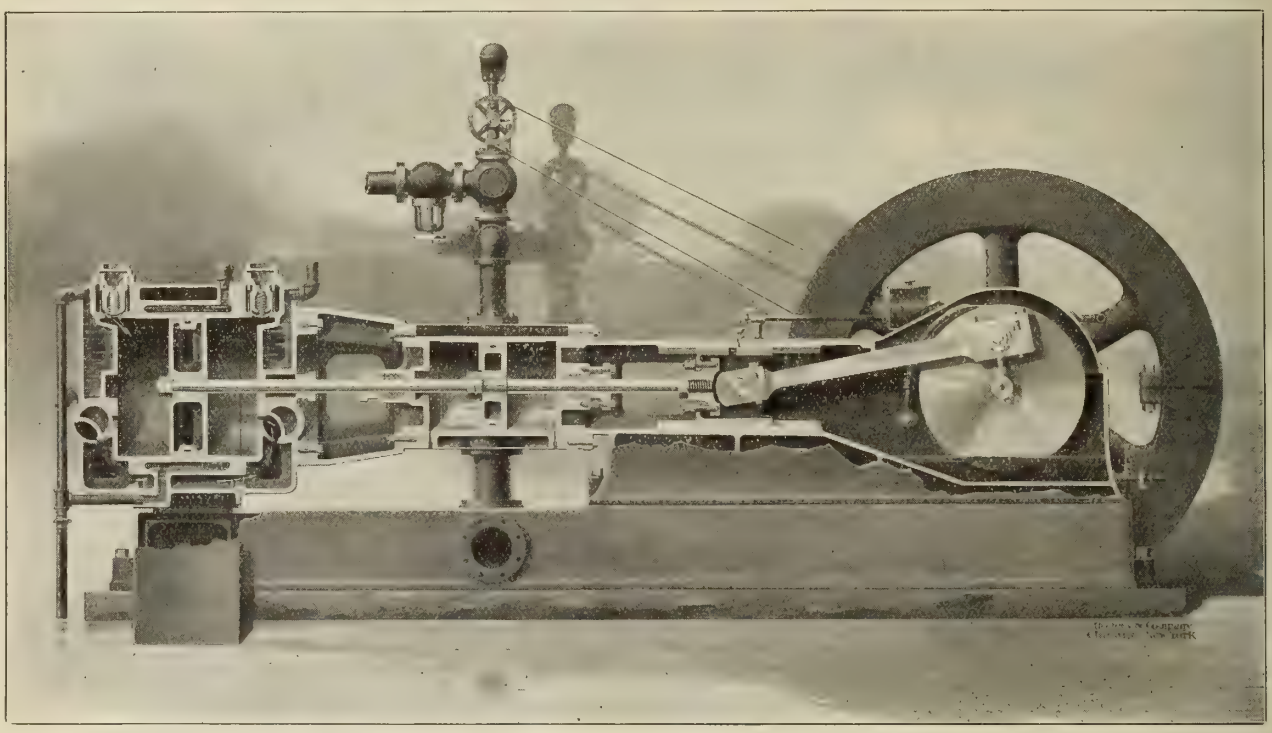
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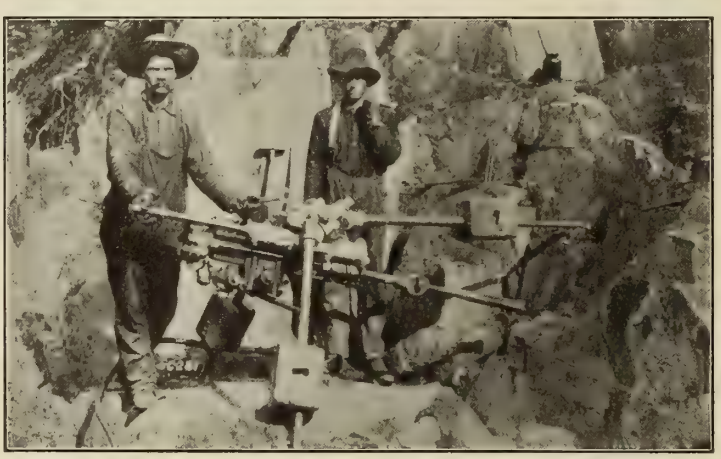
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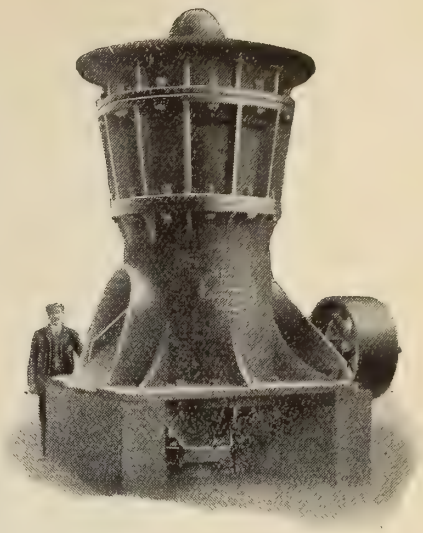
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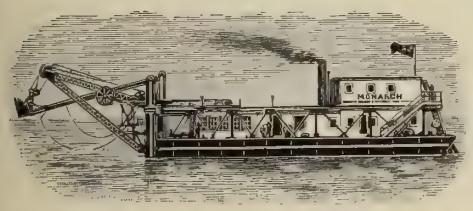
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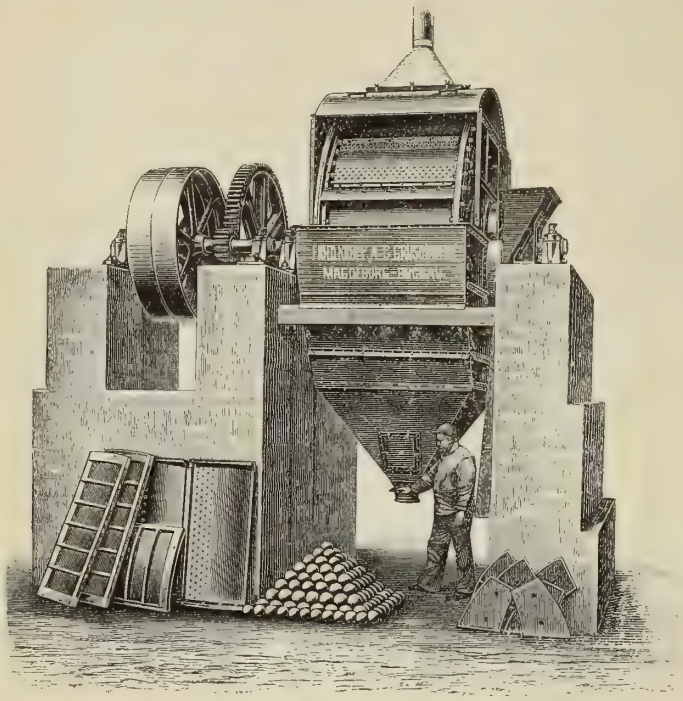
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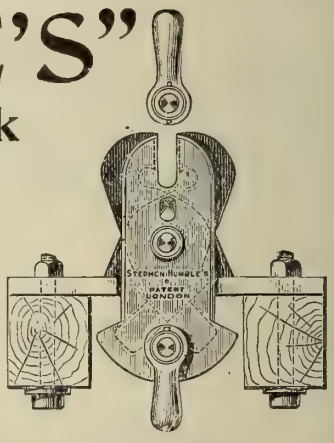
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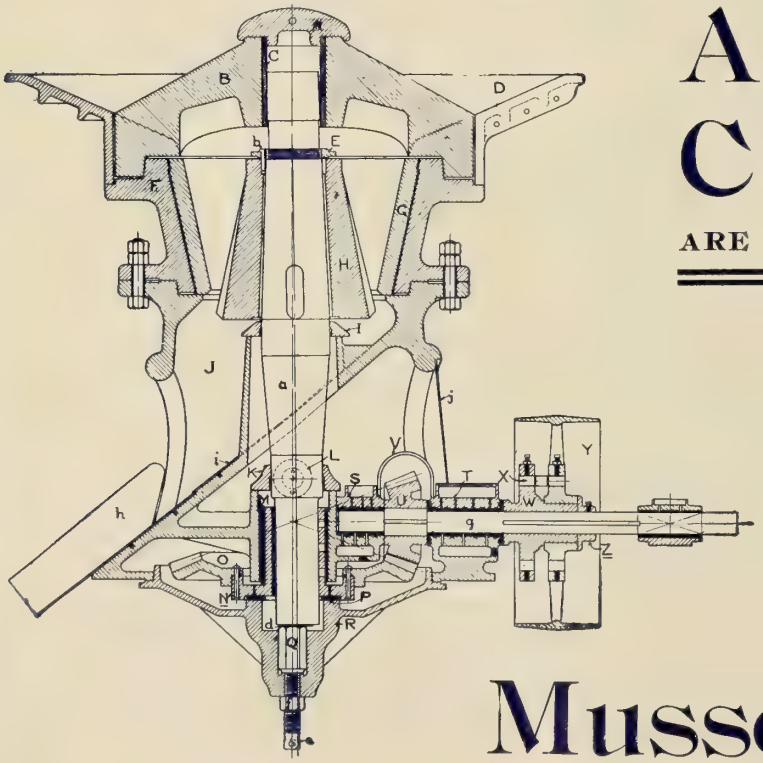
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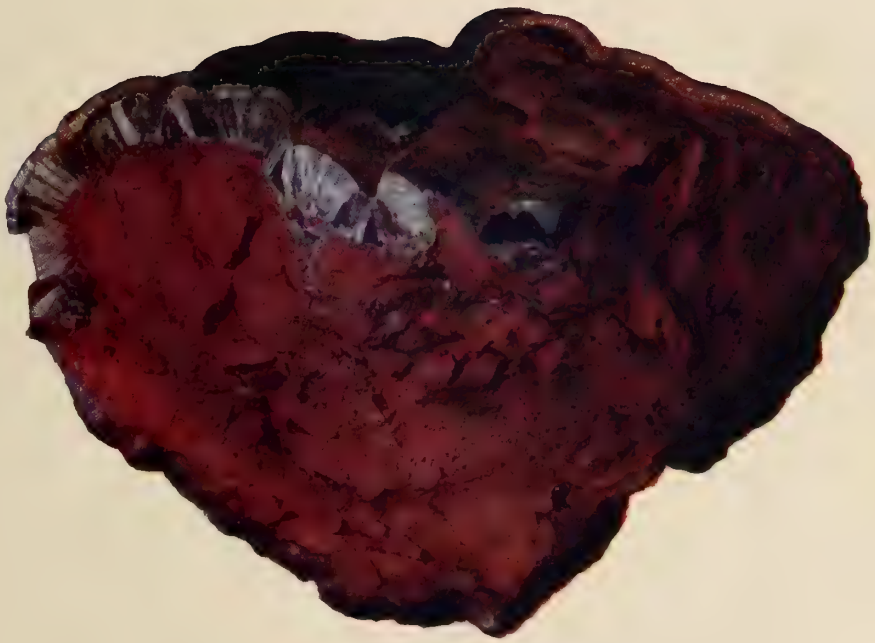
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The Canadian Mining Journal

VOL. I. No. 3, New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 5

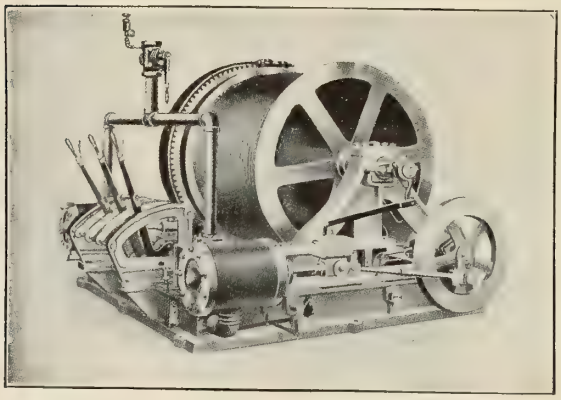


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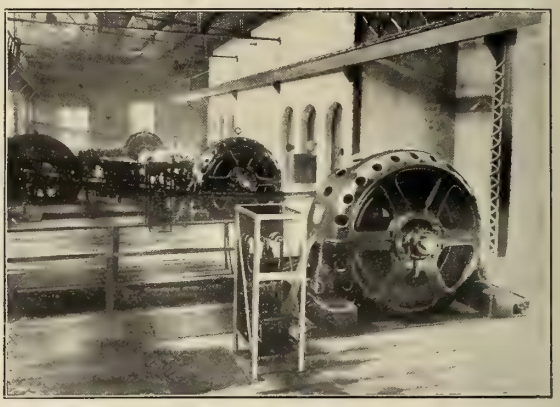
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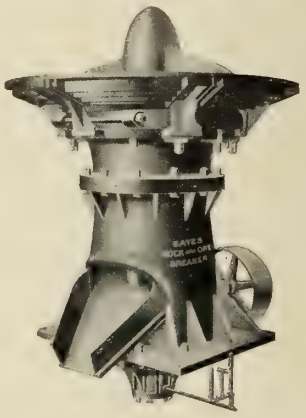
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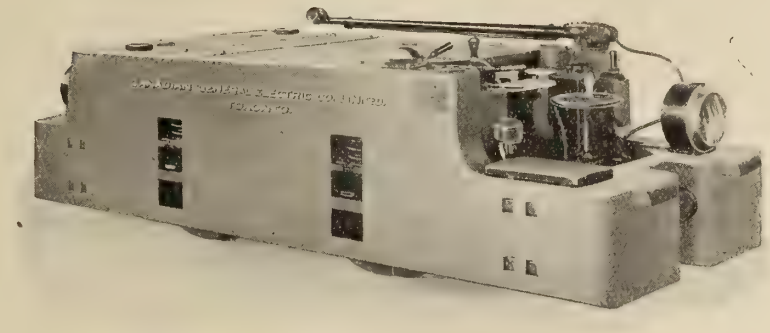
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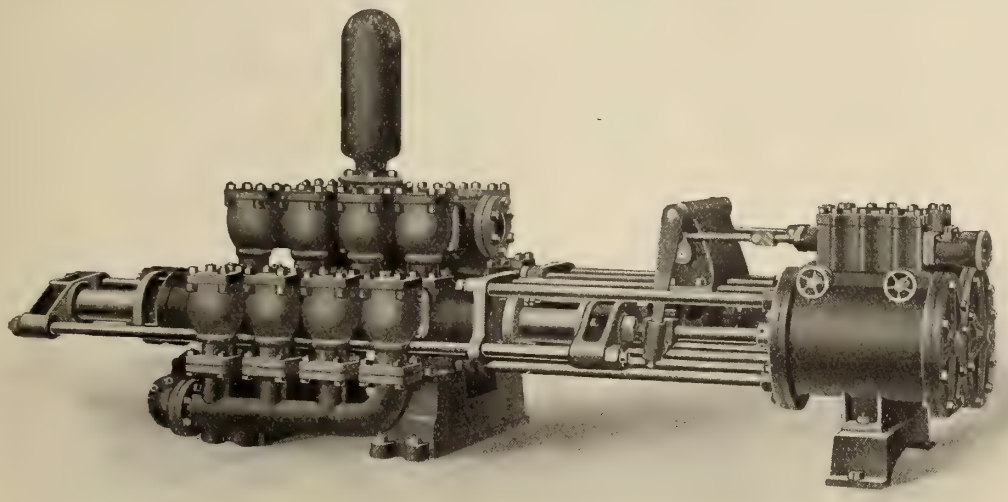
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The diversified field of Canadian mining admits of adequate treatment only when dealt with in sections. While endeavoring to make each number of The Canadian Mining Journal contain something of local interest to each of the mining districts of the Dominion, it is intended that, from issue to issue, some one locality or Province will be given more exhaustive treatment.

The first number of the Journal devoted a rather large amount of space to the new Cobalt nickel-silver district of Northern Ontario, and stamped that number as a Cobalt one by using on the front cover the handsome colored engraving of a Cobalt specimen, that won such encomiums on the appearance of this issue.

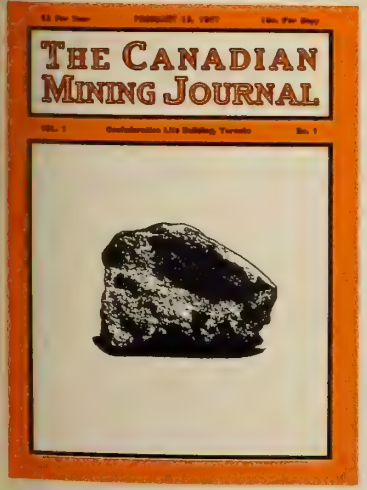
The series was departed from by the second number in compliment to the Canadian Mining Institute, whose annual meeting and proceedings were amply dealt with.

With this, the third number, we again take up our plan of dealing with the several mining districts of Canada in greater detail, this time featuring the richly mineralized Province down by the sea. The specimen of Nova Scotia iron ore which appears on the front cover is somewhat reminiscent of the one used on our first number, and although the values per ton are scarcely so great as in some of the native silver slabs from Cobalt, the immense deposits of this ore in the Eastern Province, in close proximity to the extensive maritime coal fields, promise wealth little less alluring.

In our next issue the Province of Quebec will be given the place of honor, and a specimen of asbestos, as a representative mineral, will be reproduced in the natural colors on the front page.

This series will be continued from time to time until the representative minerals of Canada have been exhausted.

In our efforts we want your co-operation. Suggestions and criticisms will be welcomed by the Editorial department. The Business department appends a subscription blank and will appreciate your support as a subscriber. If you have already sent us your subscription kindly recommend The Journal to your friends. Sample copies will gladly be sent to any address on application.



The Canadian Mining Journal.

190.....

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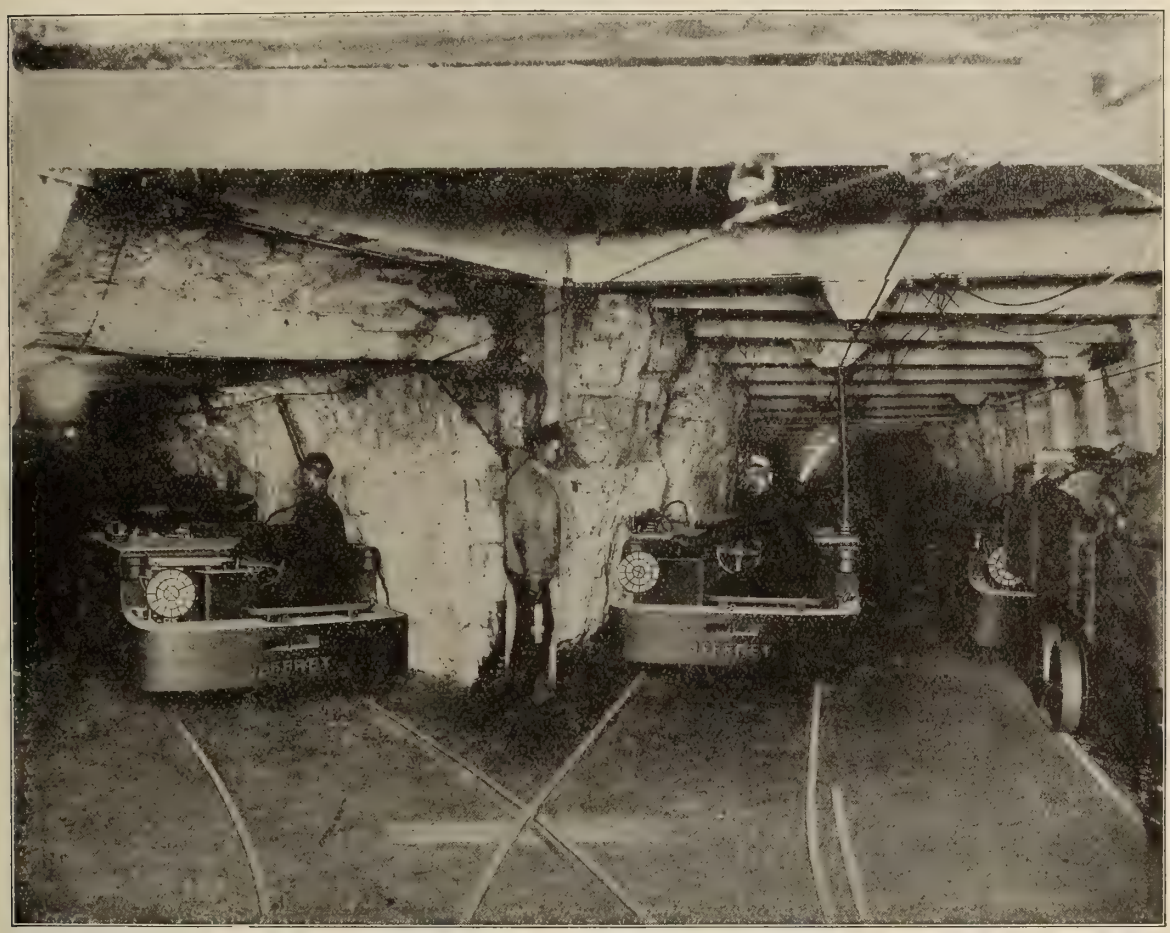
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QUARTZ—A person 18 years of age, or over, having discovered mineral in place, may locate a claim 1,500 x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. The allied metal, cobalt, is also found in Ontario in unsurpassed quantities.

The output of iron, copper, nickel, silver and cobalt in 1906 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

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For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows :

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre ;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel, and also graphite, asbestos and phosphate of lime ; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

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Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mlneral belt in which remarkable discoveries of minerals have already been made, and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey, 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

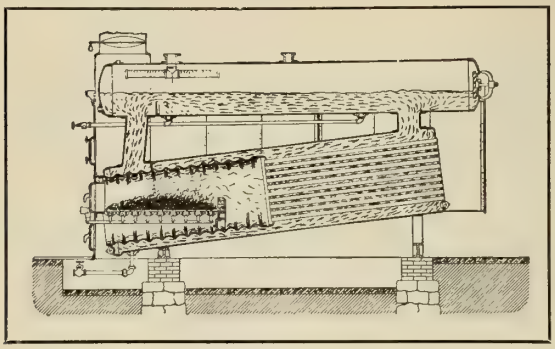
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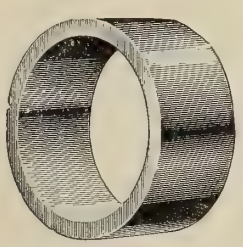
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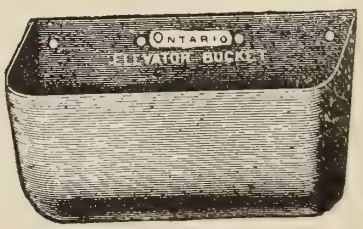
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McGill University, Montreal

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Editors:

J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMB
Sec. Canadian Mining Institute

Business Manager . . . J. J. HARPELL, B.A.
Asst. Bus. Manager . . D. B. GILLIES, B.A.
Circulation Manager . . . A. P. DONNELLY, B.A.

SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario. Dr. J. A. Woodman Dalhouse University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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DR. W. H. DRUMMOND

The death of Dr. Drummond deprives Canada of a singularly gifted son. For the past two or three years Dr. Drummond had been associated with his brothers in the development and operation of the well-known "Drummond" Mine in Cobalt, where, latterly, he spent most of his time. It was here that he died, after a brief illness, on April 6th.

Dr. Drummond's kindly muse was both robust and homely. Many of his "Habitant" poems are already accepted as permanent additions to Canadian literature. His books are looked upon as an essential part of any camp equipment. He wrote of Canadians, for Canadians. His field was his own. As a sympathetic interpreter of French-Canadian rural life he stands unapproached. His untimely death came as grievous shock to the whole nation.

FORESTRY

The Canadian Forestry Association held its eighth annual meeting in the Railway Committee Room of the House of Commons, Ottawa, on the 14th and 15th of March. The growing sentiment in favor of a more conservative and far-sighted policy in regard to our forests has been strongly in evidence at recent meetings of this association, as also in discussions of the subject in the press, and in the efforts which have been made in recent years to found forestry schools in Canada. The subject is of far-reaching importance in engineering. Wood is now and always will be cheap, strong, and easily worked structural material. For many purposes we can hardly hope to replace it. For example, it is doubtful if it can be advantageously replaced for railway ties or for mine timbers. Civil engineers are in this and in other ways intimately concerned in the question as to how we in Canada can best conserve our forest resources, and how best provide a growth of timber in those parts of the Dominion where the supply is insufficient for local demands. For in the long run it will surely be cheaper to grow the timber reasonably near the place where it is to be used than to transport it over great distances. Our great railway companies, particularly those which control extensive tracts of land, might consider whether it will not be better to set aside lands to grow tie timber for the future, rather than to sell it for a few dollars an acre.

The question is also one of deep concern for mining engineers. A constant supply of mine timber is needed, not to speak of lumber for buildings. But a more serious problem for many mines is the one of fuel. The waste in this respect is painful to contemplate. Many mines are so far from cheap transportation that coal is almost out of the question for fuel. And when the wood within reach has been used up, it often happens that the manager has nothing but a barren prospect of hopeless old brule to contemplate when he looks around for fresh supplies. The last report of the Ontario Bureau of Mines mentions a case in which a mine was closed down owing to scarcity of fuel.

Metallurgists are also interested in this subject. Charcoal is a pure fuel for reducing purposes. At Radnor

Forges, in Quebec, and at Deseronto, Ontario, high grade iron has, for many years, been made in charcoal furnaces; but the increasing difficulty of getting a supply of wood for charcoal has become a very serious problem. The charcoal retorts have been living on capital, and as a natural consequence the supply of wood is getting farther and farther away. If the rocky portions of the country, unfit for farming purposes, were kept permanently covered with forest growth, the annual increase would give a perpetual supply of wood for the manufacture of charcoal, railway ties and mine timber, not to speak of the more general uses, such as for domestic fuel, furniture, farm implements, and buildings.

It is not necessary for Canada to pass through the stages of waste and lack of foresight which have cost some of the European countries so dearly. It is possible for us to take as our object lesson the dreary wastes of bare hillsides in some parts of France and Italy, where millions are now being spent in the effort to restore the forest covering. We might even get our warning nearer home. Wisconsin has eight million acres of worthless lands, once covered with a fine growth of timber. Michigan can also show her warning scars. Both States, with many others, must now consider, if they have not already begun to solve, the slow and very expensive process of reforestation. Why should not Canada omit this stage? She can do so by selecting now the lands which are to remain under forest because unfit for farming, or because the forest is needed to conserve and regulate the flow of water from watersheds. This means wise foresight, a far-seeing view of national interests—in a word, statesmanship.

THE LORD'S DAY ACT

On March 1st the Lord's Day Act became operative in British Columbia. Its rigid enforcement will, beyond all shadow of doubt, militate against the mining and smelting industries, more particularly against the latter. In itself the Lord's Day Act may be an admirable thing. In its general operation it may conduce to the good of the whole Province. But its promoters should take care to inform themselves thoroughly as to its certain effect upon the mining and smelting interests.

There are several metallurgical processes, the whole value of which depends upon their continuity. For example, no iron smelter could survive a regular stoppage of work on Sundays. At nearly all mines a certain amount of labor must be performed on the Sabbath, else work would be suspended on Monday.

We know of a case in our own experience, where the over-zealous apostle of Sabbath observance wrought havoc with a struggling enterprise. Should British Columbia be made to suffer from the intemperance of religious enthusiasts, the whole question of Sabbath observance will receive a serious setback.

MONTREAL RIVER

After such examination as the weather conditions of early spring would permit, Professor Miller reported favorably upon the new silver district lying between Lady Evelyn Lake and Elk Lake. Even tentative official approval will cause a tremendous rush to these areas. As one possible effect of this movement, it is to be hoped that the tropical growth of Larder Lake capitalizations will be checked as by the expulsive power of a new affection.

In his earliest report on Cobalt, Professor Miller asserted that there was every likelihood of recurrences, to the west, of deposits similar to those at Cobalt. This is one addition more to the debt that the Province and the mining fraternity owe to the sagacity and perspicuity of Ontario's Provincial Geologist.

THE PROMOTER

The professional promoter has many sins for which to answer. When the high gods look over his accounts they will notice upon the debit side the scalps of investors innumerable.

The mine promoter, having staked out a claim near the Sinful Sucker, asseverates that since his own property answers to the name of Shameful Swindle, and since both names have an equally sibilant sound, therefore he is justified in expecting seven hundred ounces of gold per ton.

These statements, after due wrapping in the tinsel of high-sounding technical phrases, are served to the public through the daily press. The advertising artist spares no pains. He leaps from hyperbole to extravagance, from extravagance to nonsense. Beside his pyrotechnics, the cold and truthful estimate of a mining engineer looks appallingly flat. How long the public will continue to swallow the misstatements of the promoter we do not know. But we do know that the cooperation of every *bona fide* mining engineer, of all genuine mine operators, and of our technical educationists, is needed to educate the investors of Canada up to a point where they can distinguish the meretricious from the legitimate mining proposition.

EAST AND WEST

Could we acquire perspective by projecting ourselves into the future, and were we then to look back upon the past half decade, we would realize the tremendous import of our country's recent development. An added significance would then be given to the discovery of coal in the Western Provinces. The movement of population to the West, the re-population of the East by wisely controlled immigration, and the consequent readjustment of relations could be traced.

That the West will fulfil its rich promise of to-day, we do not doubt; but we believe, also, that the Maritime East will rehabilitate itself. Already it possesses every essential of natural prosperity. It suffers by contrast with the alluring West. But, all in all, the East is as rich in opportunity as is the West.

THE CHEMIST AND HIS OPPORTUNITIES

To-day the miner protects himself and cudgels operator and public with that most effective weapon, the strike. Elaborate and comprehensive labor organizations give the strike its efficacy.

No such weapon is in the hands of the technical chemist. After four college years—and three intervening summers of unremunerative toil—the chemist becomes an underpaid, overworked assistant in the laboratory of a metallurgical or mining plant. Here the deadening routine stultifies him, robs him of initiative. Conscientious and accurate work is expected of him. A mistake of his may cost his employers hundreds of dollars and him his position. He knows that many of the foremen on the plant get twice his pay and shoulder not a tithe of his responsibility. Also he is aware that cheap

chemists are replaced with ease. All of which does not bring inspiration.

The disabilities under which the chemist labors are due in small part to himself. He accepts wages that, in these days of constantly increasing cost of living, hardly suffice to feed and clothe him, and he is backed by no organization of his fellows. But upon the employer rests the larger share of blame. He looks upon the chemist as a superfluity. In engaging him he conforms to a certain growing custom, and that is all. It remains for him to extract from the chemist a maximum of work for a minimum of pay.

If the chemist proves to be a man of undoubted ability he is translated from the laboratory to some sphere of "practical" usefulness. But the chemist, *per se*, is a subordinate and humble official, who performs certain suspicious-looking operations and supplies figures for "practical" men to use.

As with all other abuses, this false conception of the chemist's functions can be corrected only by education. We talk largely and wisely of technical education for our rising generation. Our most startling need is technical and business education for our employers.

EDITORIAL NOTES

The JOURNAL extends its sympathy to McGill University in the very serious loss sustained by the burning of the Engineering Building. We note with pleasure that the Mining Engineering Department was not seriously damaged.

We wish to announce to our readers and the public generally that, in response to a very large number of enquiries, we are about to publish an authentic and up-to-date map of the Cobalt district. This map will have the merit of being both complete and accurate.

THE CANADIAN MINING JOURNAL will welcome letters from its subscribers on any subject pertaining to mining. Any requests for information of a technical nature will receive prompt attention. But it is undesirable that the JOURNAL should attempt to give information to individual enquirers about isolated mining camps; neither is it well that we should try to advise in matters pertaining to the stock market. There are many capable mining engineers and brokers whose business it is to advise in these matters.

A company has been organized in London, England, for the purpose of manufacturing "coalite," a smokeless fuel. The process of manufacture is yet a secret, but several plausible guesses have been offered. It is supposed that bituminous coal is subjected to treatment with superheated steam. The resultant "coalite" carries about 10 per cent. volatile matter and is perfectly smokeless. Petrol, for which the demand is increasing out of all proportion to the visible supply, is to be secured as a by-product. The process, it is claimed, will serve the double purpose of abating smoke nuisance and of relieving the petrol market. The project sounds somewhat too good to be true.

Annual Meeting of the Mining Society of Nova Scotia

The fifteenth annual meeting of the Nova Scotia Mining Society was opened in the Board of Trade rooms, Halifax, on Wednesday morning, March 27th, 1907. President Hayward's opening address, which is given below, was encouragingly optimistic.

After the opening address, Secretary Wylde's report was read, new members were elected, and the reports of various committees received.

On Wednesday evening the annual banquet was held at the Halifax Hotel. The banquet was attended by about 200 guests, and was a most unquestioned success. Indeed, the smoothness with which every feature of the dinner was carried out deserves more than passing mention. A military band provided most acceptable music. A paper by Mr. Robert Reford on "Transportation," and an address on "Municipal Ownership," by the Rev. Dr. Magill, were listened to after the dinner. On Thursday afternoon, March 28th, the annual session was concluded.

During the sessions the following papers were read and discussed:—

"Mine Pumping with Direct Connected Turbine Pumps," by P. H. Moore, M.E.

"Sinking and Timbering of the Allen Shaft," by H. E. Call, M.E.

"History of the Mining Society of Nova Scotia," by G. W. Stuart, M.E.

"Notes on the Property of the Seal Harbor Mining Company," by T. G. MacKenzie.

"Classification of Coal," by A. L. MacCallum, B.Sc.

"Coal Shipping Piers," by Hiram Donkin.

"Geological conditions of the Iron Ores of Nova Scotia," by Prof. Woodman.

"Coal Sampling," by Prof. Woodman.

"Londonderry Furnace Practice," by H. S. Badger.

"Sibley Mine, North Brookfield," by E. Percy Brown.



PRESIDENT—MR. C. J. COLL, STELLARTON, N.S.

The new officers elected are:—President, C. J. Coll, general manager Acadia Coal Company, Stellarton; 1st Vice-President, Dr. J. E. Woodman, Dalhousie College, Halifax; 2nd Vice-President, T. J. Brown, general manager Nova Scotia Steel & Coal Company, Sydney Mines; Secretary-treasurer, H. M. Wylde, Halifax. Council—Ald. J. A. Johnson, Dr. H. S. Poole, Prof. F. H. Sexton, G. W. Stuart, R. H. Brown, Hon. B. F. Pearson.

ADDRESS OF THE RETIRING PRESIDENT, A. A. HAYWARD.

Mr. Vice-President and Gentlemen:

This being the fifteenth anniversary of the Mining Society of Nova Scotia, as well as its fifteenth annual meeting, it is but natural that we should seriously consider the affairs of the Society by glancing back to the days of our first meetings, to the days of anticipations, to-day but partially realized.

To-day we ask ourselves: Are we fully satisfied with the results that have been obtained through organization? Have we, as members, given to the Society our individual and loyal support? Can we claim any individual improvement in ourselves because of our having helped to create and support the Mining Society of Nova Scotia? Has the Society been all you could desire, and has it accomplished sufficient to warrant its existence, and entitle it to respect and public recognition?

If anyone were to cast a stone into a body of water, of more or less extent, its influence would be recorded on shores far from the central point of disturbance. And just so can we liken the individual efforts of the gentlemen who compose this Society. Their individual efforts and experiences recorded in the transactions of the Society, and the discussions that have naturally followed, must have in some degree influenced and moulded public opinions.

Where are they, within, or, without, the circle of this Society that can truthfully say, the experience recorded in the form of papers by its members, during the years that have past, have not gone out from this humble centre and been far-reaching in their effects, and perhaps been instrumental in assisting some hesitating chap up the hill of uncertainty, and perhaps brought success where before failure seemed imminent? On the other hand, the recording of our experience may have been instrumental in preventing others from undertakings costly both in time and money, and possibly may have prevented disaster.

I venture to say there are none present, who review the days of the old four-stamp mill, with all its defects in construction and operation, but will admit the improved conditions in the stamp mills of to-day (at least in this Province) are not largely due to the recording of experiences of many of the men, who early in the history of this Society occupied prominent positions on its council. How many are there who recall the primitive mining, pumping and hoisting plants that dotted this Province from one end to the other, who do not feel the greatly improved conditions in these mechanical appliances are also in a large measure due to interchange of ideas and experience of members of this Society?

One might multiply at length, and still the result would be the same, and in the end we would conclude that apart from the social side of our corporate existence we have after all been some individual benefit to each other; and that perhaps some tiny wavelet of our experience, though enfeebled by its journey, may have reached some distant shore, and while not entirely adapted to its new environments may find lodgement in some sympathetic surroundings and bring forth abundant fruit in due season.

ROOM.

On behalf of the Room Committee, I have much pleasure in welcoming you to the new home of the Society, which, through your indulgence and generosity, has been secured and furnished at the expense of the Society, and the committee sincerely trust that their efforts will meet with your approval.

There surely should be a feeling of satisfaction and rest when we realize, after all our wanderings, that we are at last and for the first time in our history established in quarters befitting the dignity of a Society whose members represent the largest and most important portion of the industrial activity of the Province of Nova Scotia, the royalties from which largely defray the expenses of our political Government.

During the year the books belonging to the Society, which were stored at the Science Library, have been housed in cases in our new quarters, and one hundred and thirty-four new books added to the library. I consider the acquiring of a library most important, but in doing so it would be well not to duplicate books already in the Science Library.

BUILDING.

I would strongly recommend that the Society keep in mind the desirability, if not the necessity, of owning a suitable building in which to make a permanent home. I might say that I do not think it beyond the range of possibility that sufficient money might be donated for such a purpose, providing proper steps were taken to secure it. This work could best be done by the appointment of a committee, which I would strongly recommend.

AMALGAMATION.

I am also of the opinion that an amalgamation of the Engineering Society with that of the Mining Society of Nova Scotia would result beneficially to both, as the addition of their numbers would greatly increase the effectiveness of this Society, while both would receive largely increased benefits, and the operating expenses per member would be reduced.

It must be apparent that there is not sufficient room in this small field for two societies working along similar lines if they are to accomplish results.

By-Law.

By-law VII., regulating the election of officers, is ambiguous and should be repealed and another substituted. And again, the preparing of a slate by the council does not give satisfaction, conveying as it does the impression that the Society is run by a clique, which impression should not be allowed to continue if good government and harmony is desired.

Nominations should be made by members only. Nine members should compose the council, instead of six. This would give better representation to the country at large.

been satisfactory to the operator, and that the same degree of satisfaction has been enjoyed by the consumer. But this is purely a trade question, and cannot wisely be taken up in a Society representing the technical side of commercial life.

Gold Mining.

This industry, according to the official returns, was still on the decline during the year 1906, the total yield of gold being about 14,000 ounces, and which is about 1,000 ounces below the yield of 1905.

Several causes are by as many different people assigned as a



PAST PRESIDENTS AND SECRETARY OF NOVA SCOTIA MINING SOCIETY

Publications.

It has been proposed by the secretary of the Canadian Mining Society that your transactions be published in connection with those of the Institute, and that the Institute would be willing to do this at a cost not to exceed the present cost of the publication to this Society.

There should be considerable advantage by such an arrangement, but if any future plans for amalgamation with the Engineering Society are to be considered, it would be unwise to tie the Society up by considering such offer too hastily.

Coal Output.

The output of coal during the year 1906 was, roughly, 5,850,000 tons. The returns from this important industry, we trust, have

reason for the falling off in the yearly production, all having a certain amount of merit.

That there will ever be any material improvement in the general conditions of metalliferous mining in this Province, until the Department of Mines is divorced from the Department of Public Works, and a man placed at the head of the Mines Department who is not responsible to party politics, but is dependant upon his own ability, is a question this Society would do well to consider. And if the Society would adopt, as one of the things to be accomplished during the year 1907, the investigating of the decline in gold mining, I am confident the results would be found sufficiently encouraging to entitle us to bring the matter more forcibly before the Government.

IRON MINING.

This industry is receiving more recognition than in former years. There seems to be an increased demand for native ore. This is no doubt largely due to the increased bounty on iron made from native ore.

It was to be hoped that at least a part of the bounty now paid to the iron master would have been paid to the producer of native ores. Such a policy would encourage prospecting and stimulate the development of many encouraging locations.

TECHNICAL EDUCATION.

This most important subject has during the year occupied much time and thought, but not more than the subject deserved or required.

And after many trials and changes of position, the establishment of a school of technology in this Province, and by the Local Government, seems to be quite well assured.

To accomplish this, it was necessary to secure the co-operation of all existing educational institutions, who, by their moral support, made the situation possible, at the same time securing harmony. And as the gentlemen from the various institutions who by invitation met in these rooms last April, for the purpose of more fully considering the entire project, most earnestly supported the plan proposed by your committee, and by their support opened the way for the Government to safely and seriously consider the project, they naturally expected that when a final decision was reached, and before any bill was drafted and presented, all the contracting and interested parties would be called together again for consultation, and that a bill would not be constructed on the advice alone of gentlemen from any one of the institutions, and especially from the one which would, under the provisions of the bill, receive the larger amount of benefit. But such are the regrettable facts. The Society, however, has nothing to regret, as their actions have been open and above board. And now that their efforts are apparently to be crowned with success, the credit, if any is to be enjoyed, belongs to Mr. Alex. McNeil, the gentleman who first called to the attention of this Society the necessity of higher technical education for the young men of this, his native Province.

MEMBERS.

During the past year, while the membership of the Society has not largely increased, there has been no falling off, either in its members or their loyalty to the Society. There has not, however, been given that individual and collective support that was anticipated, and without which no Society can expect to accomplish high attainments. Yet, judging from past experience, had serious conditions arisen demanding united action and enthusiastic support, I am confident the opportunity to demonstrate the fervent loyalty of its members would not have been neglected.

Nevertheless, passive submission and willingness to allow things to drift when no clouds darken the horizon, are not conducive to good government; nor can the Society under such conditions be reasonably expected to ripen or mature the soundest and best fruits of progress and edvelopment.

I therefore earnestly recommend that each and every member give to the incoming administration such support as he himself would expect were he similarly situated. And if this is done there need be no apprehension as to the results that will be accomplished by the Society.

There are many valuable objects which this Society would do well to interest itself in, and which are closely allied to the more complete development of this Province. It should not be necessary to wait until the opportunity overtakes the Society. But go and meet it half way; and, if necessary, go farther and create the opportunity, and by so doing establish the right of the Society to increased recognition and respect.



INTERIOR OF CAST HOUSE, LONDONDERRY, N.S.

SUBJECTS.

There is set forth, as one of the objects of the Society, the interchange of ideas by meetings, and reading of papers, and it is assumed scientific and practical results were expected to follow the reading of such papers and the discussions that would naturally follow. I would strongly advise a still closer application along such lines, rather than admission and discussing of commercial subjects, which only have tendency to lower the character and tone of your deliberations. Such subjects more rightfully belong to commercial associations and boards of trade. The dignity of the Society can only be sustained and successfully continued by keeping a watchful eye over its transactions and discussions.

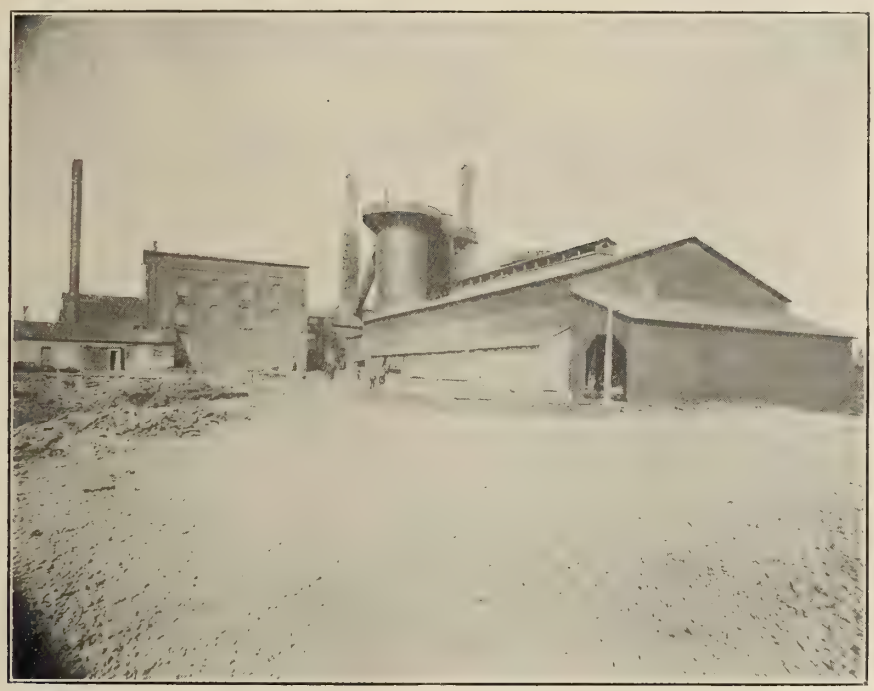
A. A. HAYWARD,
President.

March 27th, 1907.

LONDONDERRY IRON AND MINING COMPANY

Snugly ensconsed at the foot of the Cobequid Hills, two miles off the main line of the Intercolonial Railway, lies the town of Londonderry. The town owes its being to two enterprises which are carried on within its limits—the blast furnace of the Londonderry Iron & Mining Company, and the pipe foundry of the Canada Iron Foundry Company. A brief description of the former industry is the object of this paper.

The history of iron-making in Londonderry would make a long and interesting narrative in itself. It may, perhaps, be the subject of a later article. For our present purpose it suffices to say that, after suffering many vicissitudes, the old Londonderry Iron Company shut down their works in 1896. Six years later—1902—a group of Montreal gentlemen, prominent among whom were Messrs. T. J., George E. and J. J. Drummond, and Mr. Edgar MacDougall, decided to take over the plant, mines and lands of the old company and start iron-making once more. As a result



BLAST FURNACE, CAST HOUSE AND ENGINE ROOM, LONDONDERRY, N.S.

of negotiations, the plant, iron mines, and about 33,000 acres of land, carrying much excellent timber and cordwood, became the property of the new Londonderry Iron & Mining Company.

The work of renewing the whole plant, of opening the mines, of remodelling and relining the furnace, and of repairing the old coke ovens, was begun in September, 1902. Adverse conditions of labor, weather and transportation made this an arduous task, and it was not until January, 1904, that the furnace was blown in.

Meanwhile, under the direction of Mr. J. J. Drummond, the furnace lines had been very radically altered. The bosh was lowered, and the lines were adapted to the reduction of the local ores. A coal-washer of the Robinson type was erected, and a battery of 30 bee-hive ovens added to the old ones, making a total of 97. The washer was designed to handle about 400 tons of dry coal per day.

A new cast-house for handling the pig iron was erected. The old English blowing engines, which had been in commission for over twenty years, were thoroughly repaired and gave good service from the start. The three Cowper stoves were also thoroughly overhauled and repaired.

A second, smaller blast furnace was pulled down. The erection and equipment of an excellent laboratory, of repair shops, car shop, machine room, blacksmith forges; opening the mines and shipping and stocking ore, coal and coke occupied the greater part of the year 1903.

After the furnace was "blown in," during January, 1904, there still remained much to be done. During that year a commodious office building was constructed, the contract being handled by Rhodes, Curry & Company, of Amherst, N.S. During 1905 and 1906 much prospecting and mine development was performed under the superintendence of Mr. W. F. C. Parsons, M.E. Early in 1903 shipments of red hematite from the Torbrook mines were started, and these have continued ever since. The company now owns and controls the Torbrook mines, in addition to its large Londonderry workings.

For a time limestone was purchased from Brookfield, South Maitland, and other points. But gradually the feasability of using the ankerite, which occurs in almost unlimited quantities on the company's Londonderry lands, was proven. This is now, and has been for the past few years, used exclusively as a flux.

Coal for coking purposes is supplied by the Intercolonial Coal Company of Westville, the Cumberland Railway & Coal Company of Springhill, the Acadia Coal Company of Stellarton, and the Port Hood-Richmond Railway & Coal Company of Port Hood. Shipments are made over the Intercolonial Railway to the Londonderry branch line.

Coke is purchased from the Intercolonial and Acadia Companies.

The Londonderry Company operates about ten miles of standard and narrow gauge railway. Its rolling stock includes two standard gauge and three narrow gauge locomotives, besides many flats and mine cars.

The local ores are limonites, specular and brown hematites, paints, siderite and ankerite. Mines are operated at Old Mountain, Cook's Brook, Martin's Brook, and Cumberland, which lie from one mile to four miles west of the furnace. To the east, and reached by the Intercolonial Railway, to East Mines Station,

thence by spur line to the ore trestles, are the East Mines workings. At all of these mines the above mentioned ores are found in varying quantities. At and near East Mines, immense bodies of clean ankerite have been proven.

At all of the mines brown ore, of varying degrees of hydration, is found. Old Mountain is particularly rich in specular.

It must not be overlooked that at many intermediate points between the east and west mines, rich ore has been found. There is, therefore, no cause to doubt the existence of a large, though irregular, body of ore, extending practically over all the distance between the extreme workings.

The Londonderry ores are phenomenally free from sulphur and phosphorous.

The Torbrook ores are red compact hematites and grey or red-gray magnetites. The former are rich ores, carrying about 1 per cent. phosphorous. The latter ores, though not so rich in iron, carry enough lime, in many cases, to be self-fluxing.

By a curious provision of nature, the Londonderry and Torbrook ores are mutually adapted to supplement each other's deficiencies in producing a foundry pig iron.

At this point it may be well to mention a few facts about the blast furnace, blowing engines, etc. The furnace stack stands 75 feet in height. Its bosh diameter is 17 feet, and its hearth measures 10 feet. The furnace lines, as mentioned before, were radically altered by Mr. J. J. Drummond. It is admirably adapted for the smelting of the local ores. Its capacity is about 120 tons in twenty-four hours.

The two English blowing engines, built thirty years ago by Daniel Adams, of Manchester, England, have given wonderful service. Recently they have been supplemented by a third large American blowing engine. Their united delivery at 28 revolutions is about 26,000 cubic feet of air per minute. The three Cowper stoves are soon to be supplemented by a fourth. Mr. G. C. Mackenzie, B.Sc., has been in charge of the furnace for the past three years.

In summer, Londonderry is one of the many unsuspected beauty spots which the traveller over the Intercolonial Railway misses. Soon after passing through the famous Wentworth valley, Londonderry Station, an unpretentious hamlet, is passed. Hidden behind it lie the green slopes of Folly Mountain and Old Mountain, between which nestles the Londonderry Iron Company's plant. On dark nights the dumping of molten slag illumines the whole countryside in a manner beautiful beyond description. Not only the hillsides and town, but the long stretch of fertile lowlands lying between Great Village and Truro are brilliantly lighted.

In former years Londonderry pig iron held a high place in the market. It was, indeed, acknowledged to be equal to the best Swedish. To-day Londonderry has no reason to abate by one jot this proud claim.

It will hardly be fair to close this paper without stating that it is the writer's intention to take up in later articles the geological and other features of this very interesting district. The purpose at present is merely to introduce the subject in a more or less superficial manner.

POWER FROM THE PIT MOUTH

By A. D. Ross

In the rapid settlement, growth and progress of Western Canada, there is a tendency to lose sight of the development—especially along industrial and manufacturing lines—that is taking place here in the east.

There are, for instance, here in Cumberland county, Nova Scotia, four or five coal mines in operation that ten years ago were not producing a ton of coal. They are now giving employment to hundreds of men, raising thousands of tons of coal, and are proving a rich source of revenue to the Province.

The Chignecto Mine, at Maccan, may be taken as a good example of what is being done in the way of developing the great Cumberland coal basin.

This mine was originally opened over thirty years ago by the Londonderry Iron Company, and was successfully operated for a number of years.

Owing to the unfortunate financial career of the above mentioned company, the mine was abandoned, and, for nearly a score of years, the once thriving hamlet of Chignecto remained a veritable "deserted village." The houses became untenanted. The mine filled with water. The place itself became a spot of dreariness and desolation.

About five years ago Senator Mitchell, of Drummondville, and his brother, Mr. David Mitchell, of the same place, with one or two other Montreal gentlemen, became impressed with the great future possibilities of the Nova Scotian coal areas. Mr. H. J. Logan, M.P. for Cumberland, induced them to pay a visit to a number of the mines of the county, and, as a result, they shortly afterwards acquired the lease of the Chignecto property, which embraces about 27,000 acres of the land surrounding the pit and the village.

Then followed the organization of the Maritime Coal & Railway Company, of which Senator Mitchell was president and Mr. David Mitchell was managing director.

The company had to face many difficulties. The mine had to be pumped out, and a railway line constructed to make connections with the I. C. R. The vacant houses had to be repaired, and many new ones built. All this was done, and much more. To-day Chignecto is a flourishing village, of from five to six hundred inhabitants. The mine is equipped with the most modern machinery. New stores and offices have been erected. The old houses have been repaired, and many new ones built, and the entire village presents a view of prosperity and contentment. Over one hundred and fifty men are now employed in this mine, and the daily output is steadily increasing.

The charter of the company was amended in the year 1906, and permission was secured from the Local Legislature to establish a central electric power plant at the mouth of the pit, for the purpose of supplying power and light to surrounding towns, the name of the company being at the same time changed to the Maritime Coal, Railway & Power Company.

It is expected that by the first of April the company will be in a position to supply the industries of Amherst, which is situated about nine miles from the mouth of the pit, with the necessary power to operate their plants.

A central station of brick and concrete has already been completed. The engines and boilers are now being installed. The concrete transforming station in Amherst is finished, and the "transformers" are expected to arrive this week. The wire line from the central to the transforming station is also completed. The power will be sent from the former to the latter at a voltage of eleven thousand, which will be reduced to twenty-two hundred at the transforming station and at that voltage supplied to the various industries.

It is interesting to note that this is the first plant of its kind established on the North American continent, and the third in the entire world.

Anyone with any knowledge of coal mining is aware of the fact that there is always a large per cent. of refuse or waste coal for which no market can be obtained, and it is the purpose of this company to use this waste for the production of industrial power. Even if the marketable coal is used, the company contends that it is cheaper to transmit the power direct, rather that to ship the coal.

Amherst is one of the leading industrial centres of the Maritime Provinces. It is the home of flourishing workshops, which send their products all over this Dominion. The establishment of this power plant promises to bring about a new epoch in its history. Persons or companies desirous of starting new industries will not require a large expenditure for a plant producing

power. A wire from the transforming station with a motor will be all that will be required. Thus, the citizens of Amherst are looking forward with confidence to the establishment of many new industries in this town.

The company has met with such assurances of support that it has already placed an order to duplicate the original number of boilers and engines.

A coal company which has the enterprise to take up a scheme for the purpose of transmitting power direct from the mouth of the pit, instead of shipping the coal, is deserving of every success, especially when it is the first to undertake the pioneer movement.

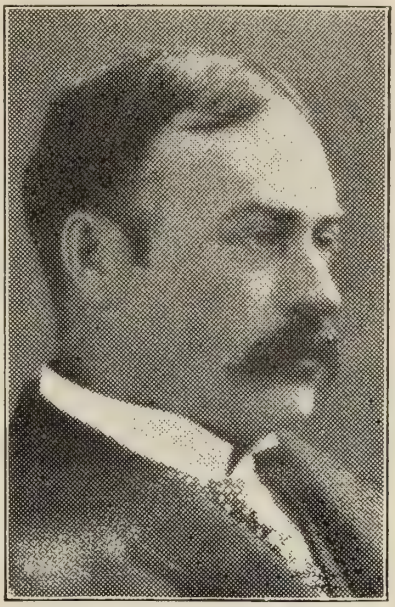
DR. W. H. DRUMMOND

Dr. W. H. Drummond, distinguished as the poet of the "Habitant," died at Cobalt, Ont., on April 6th.

Born in County Leitrim, Ireland, in 1854, he was educated at Nohill, Ireland, and at the Montreal High School. In 1884 he graduated in medicine from Bishop's College, Lennoxville. He then practiced his profession in Montreal. For a time he occupied the chair of medical jurisprudence in Bishop's College.

Much of his time and energy he devoted to outdoor sport. He was passionately fond of the woods, and of all that an intimate knowledge of forest life implies.

It was, however, as a poet that Dr. Drummond made himself famous.



DR. W. H. DRUMMOND

Latterly, his mining interests in Cobalt took up a large portion of his time. His death has aroused universal sympathy.

A Comparison of University and Industrial Methods and Discipline

An Address Delivered by Mr. Frederick W. Taylor, President of the Society, at the Dedication of the New Engineering Building of the University of Pennsylvania.

The point from which I view college education is that of the employer, not that of the educator. I have had no experience with the difficult and complicated problem that faces the professors and the governing boards of our colleges. On the other hand, I have been engaged for years in organizing the shop, office, and commercial management of quite a wide range of engineering and manufacturing establishments. This has brought me into intimate personal contact with a large number of college graduates, and I have become acquainted with their strong points, which are many, and at the same time with a few of those points in which it would seem that as a class they might be improved. And in what I shall say I have principally in mind the preparation of young men for success in commercial, engineering and industrial enterprises; in other words, enterprises outside of the four learned professions.

I despise the pessimist who sees nothing but the defects and blunders of mankind; and the scold, whose pleasure it is to complain of all things as they are.

Let me say at the start, that without question, our college graduates as a class represent the finest body of men in the community. And as to the value of an engineering course for men in our profession, it has been shown through carefully gathered statistics, that within a few years after graduation the college-educated engineer far outstrips in position and salary his average competitor who comes up from the ranks.

It would be a much more congenial task to dwell upon this view of the profession, but something may possibly be gained by considering what has seemed to many of the friends of our young graduates to be the one defect which they practically all have in common.

For a period of from six months to two years after graduating they are, generally speaking, discontented and unhappy. They are apt to look upon their employers as unappreciative, unjust, and tyrannical, and it is frequently only after changing employers once or twice, and finding the same lack of appreciation in all of them, that they finally start upon their real careers of usefulness.

On the other hand, the attitude of employers toward young graduates is fairly expressed by the following written instructions given for the selection of quite a large number of young men to fill positions which presented opportunities for rapid development and advancement. These instructions were to give the preference—first, to graduates of technical schools; second, to the graduates of the academic departments; but to employ no college boy who had not been out for more than two years.

Why is it, then, that these young men are discontented and of practically little use during the first year or two after graduating?

To a certain extent this is unquestionably due to the sudden and radical change from years spent as boys almost solely in absorbing and assimilating knowledge for their own benefit, to their new occupation of giving out and using what they have for the benefit of others. To a degree it is the sponge objecting to the pressure of the hand which uses it. To a greater degree, however, I believe this trouble to be due to the lack of discipline and to the lack of direct, earnest, and logical purpose which accompanies, to a large extent, modern university life.

During the four years that these young men are at college they are under less discipline, and are given greater liberty than they have ever had before or will ever have again.

As to college discipline, it cannot be a good training for after life for a young man deliberately to be told by the university authorities that he can flagrantly neglect his duties sixty times in one term before any attention will be paid to it; while, if

in business, the same young man would be discharged for being absent two or three times without permission.

And, as to the freedom offered by the modern university system, it is not true that boys from eighteen to twenty years old have the knowledge and experience necessary to select a logical and well-rounded course of studies, and even if they had this wisdom, the temptation to choose those studies which come easiest is so strong that it would be unwise to throw upon them so great a responsibility. Nor does it appear wise to leave each student free to study as little or as much as may suit him, at times doing practically no work for days, and at others greatly overworking, with no restraint or direction except the round-up which comes twice a year with examinations. At the least, it must be said that in commercial or industrial life this undirected liberty will never again be allowed them.

During the past thirty years two radical changes have occurred in educational methods. The kindergarten and its accompanying ideas has come for the children, and for the young men has come the change from the college, with its one or two courses carefully selected and rigidly prescribed by the faculty, to the university with as many different courses as there are young men, and in which, under the elective system, each student is given the choice of all of his studies.

The fundamental idea back of the change from college to university is excellent; namely, that of providing a far greater variety in the courses to suit the different tastes and abilities of the students, and to especially prepare them for their future occupations. Accompanying, however, this great step in advance, and yet, so far as I can see, in no way logically connected with it, has come the false step of giving our young men in many ways a greater liberty than is allowed, on the whole, to any other class of active workers; and of handing over to them the final decision in a subject most needing a master mind.

Commercial, manufacturing, and other enterprises in which many men co-operate, are managed more and more by delegating all important decisions to a few men whose judgment has been trained through long experience, study, and observation in those matters which they are called upon to decide. Yet many of our universities are managed by giving over to the young man, under the elective system, the final decision as to what studies will best fit him for his life's work, although he has, of necessity, but the vaguest idea of the nature of the subjects which lie before him. It is almost like asking him to lift himself up by his boot straps.

I cannot but think that in changing we have modeled largely after the English and German universities, which, as we know, are influenced in their management by traditions handed down through several hundred years; and that in adopting the great university idea of a variety of courses, we have at the same time blindly accepted the foreign idea of the elective system accompanied by a lax discipline, both of which are better suited to medieval times, when each man worked for himself, than to the present day, when the road to success lies through true co-operation.

In this change, also, too great stress has been laid upon those elements leading to knowledge or book learning on the part of the student, and too little upon the development of his character.

The kindergarten also, which has proved so great a help in training the younger children, making them observant and giving them a certain control over themselves, has brought with it one idea which has wrought great harm, and yet this bad idea is in no way properly or logically connected with the underlying principles of the kindergarten.

Somehow the average kindergarten child gets a firm conviction that it is the duty of the teacher to make things interesting and amusing, and from this follows soon the notion that if he does not like his studies and fails to learn much, it is largely the teacher's fault. Now, whatever views the parents or the teachers themselves hold upon the duties of teachers, there is no doubt that the boys should have firmly in their heads the good old-fashioned idea that it is their duty to learn, and not that it is the duty of the teacher to teach them.

Along with the kindergarten plan of interesting and amusing children, the idea has taken firm hold in a large portion of the educational world that the child and young man should be free to develop naturally, like a beautiful plant or flower. This may again be an excellent view for the older person to hold, but it is a distinctly bad one for the young man to act upon. He promptly translates the idea of developing naturally into wishing to do only, or mainly, those things which he likes or which come easy to him.

Of all the habits and principles which make for success in a young man, the most useful is the determination to do and to do right all those things which come his way each day, whether they are agreeable or disagreeable; and the ability to do this is best acquired through long practice in doggedly doing along with that which is agreeable a lot of things which are tiresome and monotonous, and which one does not like.

Now neither the kindergarten idea, the university elective system, nor the lax college discipline tends to develop this all-important habit in young men.

True co-operation, co-operation upon the broadest scale, is that feature which distinguishes our present commercial and industrial development from that of one hundred years ago. Not the co-operation taught by too many among those of our trades unions which are misguided, and which resemble the co-operation of a train of freight cars; but rather that of a well-organized manufacturing establishment, which is typified by the co-operation of the various parts of a watch, each member of which performs and is supreme in its own function, and yet is controlled by and must work harmoniously with many other members.

It is a mistaken notion that character of this kind needed for successful co-operation is developed by the elective idea of allowing each boy to choose for himself those things which he will do. It requires far more character to do successfully those things which are laid out for one by a wiser man than to do only what one likes, and in modern co-operation, while the work of each man is modified and more or less controlled by that of others, there is ample scope left for originality and individuality. We must remember that of all classes in the community, college boys are being trained to fill some day the position of leaders in the co-operative field. And there is no fact better established than that the man who has not learned promptly and fully to obey an order is not fit to give one.

An examination of the studies chosen by boys in the university academic departments will show that the logic and motive back of about one-half of the students is that of obtaining an easy course, and even the better students show generally a lack of clear-cut logical purpose in their selection. In their case, the studies are chosen because the young man likes or is interested in the subjects, or because they come easy to him, rather than because they give a well-rounded and balanced course with a distinct logical purpose. The loose, flabby, purposeless courses chosen by fully one-half of the students under the present system furnish but poor mental diet.

Why cannot all of the good features of the elective system be better attained by permitting each young man to choose in general the objects or purpose for which he wishes to educate himself, and then leave the entire course of studies to the one or more professors in the faculty who are especially fitted to plan a complete and logical course in the chosen field? Let the young man say where he wishes to go, and let the faculty tell him the road he is to travel to get there.

As to the object of college life, some boys are sent to the university to learn how to mingle with men, and to form friendships which shall prove useful and agreeable in after life. Some go there to amuse themselves, and some to get the standing given by a college degree.

Something can be said for each of these objects. Is not the true object of all education, however, that of training boys to be successful men? I mean men successful in the broadest sense, not merely successful money-getters. Successful, first in developing their own characters, and second, in doing their full share of the world's work.

Young men should not come to college mainly to get book learning or a wide knowledge of facts. The successful men of our acquaintance are, generally speaking, neither learned nor men of great intellect. They are men, first of all, possessed with an earnest purpose. They have a certain all-round poise or balance, called common sense. They have acquired through long training those habits both mental and physical which make them masters over themselves; and at all times they have the firm determination to pay the price for success in hard work and self-denial.

It is singleness and earnestness of purpose that constitute the great motive power back of most successful men, and it is a notable fact that the moment a young man becomes animated with such a purpose, that moment he ceases to believe in the elective system, and in the loose college discipline.

In all earnest enterprises which the students themselves manage, they throw the elective system to the winds, and adopt methods and a discipline quite as rigid as those prevailing in the commercial and industrial world.

The boy who joins the football squad is given no sixty cuts a season, nor is he allowed to choose what he will do. He does just what someone else tells him to do, and does it at the time and in the manner he is told, and one or two lapses from training rules are sufficient cause for expulsion from the team or the crew.

I say in all seriousness that, were it not for a certain trickiness and a low professional spirit which has come to be a part of the game, I should look upon football and the training received in athletics as one of the most useful elements in a college course, for two reasons: First, because in it they are actuated by a truly serious purpose; and second, because they are there given, not the elective idea of doing what they want to, but co-operation, and co-operation of the same general character which they will be called upon to practice in after life.

Is not the greatest problem in university life, then, how to animate the students with an earnest, logical purpose?

In facing this question I would call attention to one class of young men who are almost universally imbued with such a purpose; namely, those who, through necessity or otherwise, have come into close contact and direct competition with men working for a living. These young men acquire a truly earnest purpose. They see the reality of life, they have a strong foretaste of the struggle ahead of them, and they come to the university with a determination to get something practical from the college training which they can use later in their competition with men.

They are in great demand after graduating, and as a class make themselves useful almost from the day that they start in to work.

Neither their earnestness of purpose, however, nor their immediate usefulness, comes from any technical knowledge which they have acquired while working outside of the university, but rather from having early brought home to them the nature of the great problem they must face after graduating. Nothing but contact with work and actual competition with men struggling for a living will teach them this. It cannot be theorized over or lectured upon, or taught in the school-workshop or laboratory.

I look upon this actual work and competition with men working for a living as of such great value in developing earnestness of purpose that it would seem to me time well spent for each student, say, at the end of the Freshman year, to be handed over by the university for a period of six months to some commercial, engineering, or manufacturing establishment; there to work as an employee at whatever job is given him, either manual or other work. He should have the same hours and be under the same discipline as all other employees, and should receive no favors. Moreover, he should be obliged to stay even a longer time than six months, unless he has in the meantime given satisfaction to his employers.

I believe that there would be but little difficulty in obtaining the co-operation of our business and manufacturing establishments in carrying out this plan, and the University of Pennsylvania, situated as it is in the foremost manufacturing city in this country, would have an especially good opportunity to inaugurate it.

My belief in the benefits to be derived from doing practical, everyday work early in the college course is not the result of a theory. It is founded upon close observation and study of young men who have had this experience, and also upon a vivid remembrance of breakfasting each morning at five-thirty and starting to sweep the floor of a pattern shop as an apprentice some thirty-two years ago, after having spent several years in preparing for Harvard College. The contrast between the two occupations was great, but I look back upon the first six months of my apprenticeship as a patternmaker as, on the whole, the most valuable part of my education. Not that I gained much knowledge during that time, nor did I ever become a very good patternmaker; but the awakening as to the reality and seriousness of life was complete, and, I believe, of great value.

Unfortunately, laboratory or even shop work in the university, useful as they are, do not serve at all the same purpose, since the young man is surrounded there by other students and professors, and lacks the actual competition of men working for a living. He does not learn at college that on the whole the ordinary mechanics, and even poorly educated workmen, are naturally about as smart as he is, and that his best way to rise above them lies in getting his mind more thoroughly trained than theirs, and in learning things they do not know. All of this should be taught him through six months' contact with workingmen.

Let me repeat, in conclusion, that our college graduates are the best picked body of men in the community. Yet I believe that it is possible to so train young men that they will be useful to their employers almost from the day that they leave college; so that they will be reasonably satisfied with their new work, instead of discontented; and to place them, upon graduating, one or two years nearer success than they now are; and that this can be best accomplished by giving them an earnest purpose through six months' contact early in their college life with men working for a living; by rigidly prescribing a course of studies carefully and logically selected, and with some definite object in view, and by subjecting them to a discipline comparable with that adopted by the rest of the world.

Philadelphia possesses and is proud of the most notable group of medical schools in this country, and among these that of the University of Pennsylvania unquestionably stands first.

The Philadelphia lawyer has been proverbial for his knowledge and shrewdness for more than a century, and this reputation can be traced largely to the fundamental training given in the law school of the University of Pennsylvania.

Philadelphia is the centre of the largest and most diversified group of engineering and manufacturing enterprises in this country. The Engineering Schools of the University of Pennsylvania already stand high; but it seems to me that the opportunity lies open to them, even more than to their famous medical and law schools, to stand at the very top. This magnificent building, equipped as it is with the latest and best of everything, is the first and a great step toward this end. But after all, your largest possibility, and one which does not exist for, and cannot be created by any other American university, lies in the opportunity for bringing your students into close touch and personal contact with the men who are working in and managing the great industrial establishments of Philadelphia.

ELDORADO COPPER MINE

By A. G. Burrows.

The Eldorado Copper Mine is situated one-half a mile from the village of Eldorado, in the township of Madoc, Hastings county. As the Moore and Coe Mines, it was operated for some years as an iron property, from which a large quantity of excellent hematite was shipped to Ontario smelters. The iron ore was obtained from an open cut and pit, the deposit being apparently a vein associated with greenstone, with strike east and west and dip about 60 degrees north. This iron ore has occurred as a large gossan capping, overlying sulphides of copper and iron. The predominating rock in the vicinity is crystalline limestone.

The Copper Deposit.

At the bottom of the open pit a shaft was sunk to a depth of 75 feet, with cross-cuts and drifts at different levels. At a depth of 35 feet in the shaft there are 105 feet of drifting; at 55 feet, 170 feet of drifting; and at 75 feet, 175 feet of drifting. At the last depth the shaft was discontinued, and mining has since been confined to sinkings in the ore body, which occurs as a shoot, with a dip east and north. Sinking has now reached a depth of 300 feet from the surface at the inclination. The vein matter is chiefly copper pyrites, iron pyrites, hematite, greenstone and calcite, but quantities of chalcocite, bornite and tetrahedrite have been encountered at various depths in sinking.

At the lowest workings the vein is about seven feet in width, with a well-defined foot wall of crytsalline limestone. The hanging wall is granite. In contact with the foot wall is a streak of copper pyrites, bornite and tetrahedrite, and beyond this a mixture of copper pyrites, iron pyrites, hematite and greenstone. At one point a width of about four feet of almost solid copper pyrites was mined. To the south of the main pit, at the surface, may be seen quantities of malachite, which would indicate copper ore. But this occurrence is not associated with the copper in the main workings, where no green carbonates have been seen.

Very little drifting has been done, practically all the mining being confined to sinking on the copper lead, which inclines to the east. The hanging wall is supported at short intervals by very heavy stulls. The ore is raised by means of a well-constructed skipway on the foot wall of the deposit, on which the iron buckets are hoisted to the bottom of the old iron pit, and from here by a vertical hoist to the surface, where the ore is partially sorted before going to the smelter. The workings are reached by a stairway with railing, in the open pit, and by ladders in the shaft. The mine is kept free of water by a Cameron sinking pump, of a capacity of 3,000 gallons per hour. The discharged water is led to storage tanks, and is afterwards used in the boilers and for other mining purposes. Sinking is done by Mac machine drills, driven by compressed air.

Equipment.

The plant consists of an Allis-Chalmers copper smelter, one 120 horse-power return tubular boiler, one 90 horse-power boiler, one half of a ten-drill air compressor, one three-drill air compressor, one seven horse-power engine, operating a 75-lamp dynamo; one 18 horse-power engine, operating the Connellsville blower at the smelter; two compound steam hoists, of 10 and 12 horse-power, also a small hoist underground, for raising drills, etc.; one diamond drill outfit. The surface workings are lighted by electricity.

Buildings.

The power plant, blacksmith and machine shop are under one roof. Other buildings include a 30 x 35 office and laboratory, well fitted and steam heated; a 41 x 35 smelter building, and a large, commodious boarding house.

The Smelter.

The smelter is a 48-inch round, water jacket furnace, with solid cast steel crucible, and has a capacity of 50 tons of ore in 24 hours. It is located to the south of the ore dump, and on the face of a hill, affording good facilities for charging, and disposing of the slag. The ore is very basic, as will be seen from the following analysis, by the writer, of a high grade sample:—Copper, 16.40 per cent.; iron, 24.90 per cent.; sulphur, 28.54 per cent.; ferric oxide, 17.70 per cent.; lime, 1.00 per cent.; magnesia, 2.12 per cent.; silica, 5.58 per cent.; undetermined, 3.76 per cent. The only flux required for this ore is silica, which is very conveniently obtained from a quartz vein on an adjoining property. The quartz in this deposit is mined by hand drilling, and raised by a horse whim. An ordinary charge for the furnace is the following: Seven hundred and fifty pounds ore, 130 pounds coke, 110 pounds low grade matte, 135 pounds silica, 175 pounds slag. The ore is given no preliminary roasting, but is fed directly to the furnace, the sulphur, in excess, acting as fuel. The charge fuses quite readily, and the matte and slag flow continuously into a three-ton fore hearth, from which the matte is drawn at intervals. The overflowing slag is received in unlined iron settling pots, and conveyed to the slag dump. The slag is usually very low in copper, less than .02 per cent., and is essentially an iron silicate.

Shipping matte of grade 40 to 50 per cent. copper is made on the second run, and has been made on one run on high grade ore. So far, about 260,000 pounds of shipping matte have been produced. This is shipped to New Jersey, to be further refined. An analysis of matte, by Ledoux & Company, shows the following composition: Copper, 48.04 per cent.; iron, 25.04 per cent.; sulphur, 24.05 per cent.; nickel and cobalt, 0.02 per cent.; antimony, 0.02 per cent.; arsenic, 0.02 per cent.; silver, 2.6 ounce per ton; gold, 0.13 ounce per ton.

Forty-five men are employed at the mine, and are about equally divided, underground, on the surface, and at the smelter. Laborers receive $1.50 per day; drillers, $2.00; smeltermen, $1.75 to $3.00.

The property is owned by the Ontario Copper Company, and leased to the Medina Copper Company, of which Cole Saunders, New York, is president.



ELDORADO SMELTER AND DUMP

The mine is in charge of G. H. Hambly, to whom the writer is indebted for much information.

The loading dock of the company, on the Central Ontario Railway, is only a quarter of a mile from the mine shaft. It is the intention of the company to do some custom smelting of ore from prospects in the vicinity, as there are several promising quartz-copper properties, which ore would smelt excellently with the basic ore, on which the furnace is at present running.

The region about Eldorado is very prolific in mineral wealth, and, in a radius of ten miles, there are gold, silver, copper, lead, mundic, and arsenic properties, not to mention deposits of talc, actinolite, etc.

SLAG CEMENT

The manufacture of cement from blast furnace slag is perhaps the most interesting industry that has sprung from the establishment of the Dominion Iron and Steel Works at Sydney.

Soon after iron smelting was commenced in Sydney it was observed that the blast furnace slag was exceptionally favorable for the manufacture of cement, being very low in sulphur and magnesia, and very rich in lime. Encouraged by the success of similar enterprises elsewhere, more especially that of the Illinois Steel Company, and by the excellence of the slag, as well as by the remarkable advantages of Sydney as a distributing point, a company, known as the Sydney Cement Company, Limited, made an arrangement with the Steel Company to use their slag, and undertook the manufacture of cement.

Before ordering the machinery, works in Germany and the United States were visited, and the best experts were consulted, so that the plant has been designed in the light of the most advanced knowledge of the industry.

The works are situated at the junction of the Intercolonial and Sydney and Louisburg Railways, close to the Intercolonial Railway passenger station, Sydney.

The plant consists of two Ruggles-Coles rotary dryers, one set of style A Allis-Chalmers rolls, three Prosser-Krupp tube mills, Robb-Armstrong Corliss engine, Robb-Mumford boilers, and all necessary storage bins, slacking pits with mechanical screens, etc.

The buildings, including stock houses, but with the exception of the cooperage, are built of concrete and steel. Trestles for dumping raw material are also of concrete and steel.

There is a well-equipped physical and chemical laboratory, in charge of a competent chemist, with necessary assistants, and raw materials and finished product are carefully sampled and thoroughly tested and analyzed.

Samples for some of the tests are taken every hour, night and day, from each mill.

Lime of excellent quality is obtained from Marble Mountain, Bras D'or Lake.

The capacity of the plant is over 500 barrels per day.

The product of this company was put on the market two years ago, has been used for all the purposes for which Portland cement is used, namely, foundations, marine work, pavements, reinforced concrete, building blocks, etc., and has for all purposes been found completely satisfactory.

This cement has found its way into Mexico and Cuba; as far as Montreal westward, and Newfoundland eastward.

The high grade raw material used, and the care taken in manufacture, following the most recent knowledge of the industry, have resulted in a product which fully meets all the requirements of a high grade hydraulic cement.

With cheap raw material and fuel, it seems likely that the Sydney Cement Company will, for some time to come, control the market of Eastern Canada.

Sydney's geographical situation gives the company a position unrivalled for an export trade for as much of its output as may not be required for the home market.

Breathing Apparatus for Rescue Work in Coal Mines

By F. W. Gray.

Next to the prevention of colliery explosions ranks the work of rescuing the survivors and the recovery of the mine after these apparently unavoidable catastrophes, and nowhere in the annals of mining heroism, numerous as they are, can there be found such deeds of daring and self-sacrifice, too often futile and of no avail. How many would-be rescuers have fallen victims to the manifold dangers that present themselves after the blast has passed, and how many men who have survived the explosion die among the gases that follow?

In view of these too obvious facts, it is a little surprising to find how little is known amongst the average mining community about the proved and tested appliances now on the market, by means of which men can live and work in irrespirable and poisonous atmospheres, and a brief account of the evolution and present status of these so-called "breathing apparatus" may be of interest.

Although it is only within the last decade that such apparatus has been made really practical, the idea is by no means a new one, as may be found by reference to the literature of the subject in the Transactions of the Institution of Mining Engineers, ranging over the past sixty years. A complete historical summary was given by Mr. W. E. Garforth in his paper, read before the general meeting in London, June, 1906.*

Between 1846 and 1874 several devices were tried, most of them depending on a reservoir of atmospheric air. The first person to adopt the accepted principle of the modern appliance appears to have been Mr. Henry Fleuss, who, in 1880, introduced an arrangement, the principle of which he explained as follows:—

"The wearer breathes his own breath over and over again, the carbonic acid being absorbed from it at each expiration, and the requisite amount of oxygen being restored, the revivified air is fit to be again inhaled in the form of pure air."

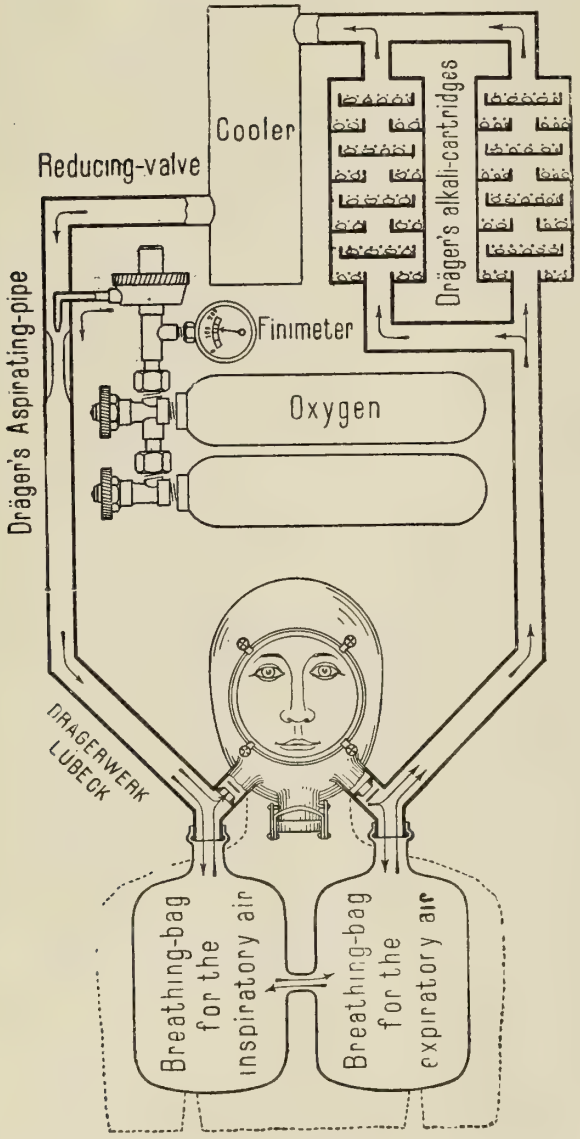
*Note.—"A New Apparatus for Rescue Work in Mines." Trans. Inst. M. E. Vol. XXII., p. 625.

For some reason or other, Mr. Fleuss' device appears to have been practically forgotten, but it was the forerunner of the perfected modern appliance, notably the "Pneumatphore" of Walcher von Uysdal, the "Meyer," "Giersberg," "Shamrock" and "Dräger" types, and the "Weg" apparatus, recently introduced by Mr. Garforth, all of which more or less resemble each other, and differ only in modification and perfection of detail.

The "Dräger" apparatus consists of two bags carried on the chest of the wearer, and communicating with the mouth, one bag being intended to hold the expired breath, and the other the revivified air intended for breathing. The breath exhalations pass along a circulating pipe, and diffuse through a series of flat dishes covered with coarsely granulated hydrate of potassium or sodium, so arranged as to give the greatest possible amount of absorbent surface. This arrangement may be very happily likened to a mechanical lung. Leaving the "lung," or potash cartridge, as it is called by the makers, the air, relieved of its carbon dioxide, passes through a cooler, and thence into the aspirator pipe. (See diagram.) What may be called the motor of the apparatus is supplied by an injector communicating with two cylinders containing oxygen compressed to 250 atm. It is claimed by the makers that this arrangement will supply 3,000 cubic inches of breathing air per minute, under a pressure of four to five inches of water column, over a period of two hours. The apparatus is constructed with either one or two cylinders as desired, and weighs, complete with the smoke helmet, 28 pounds and 36 pounds, respectively. It can also be obtained without the helmet, fitted with a regulation mouthpiece and smoke goggles. Most authorities seem to advise strongly against the use of a helmet where it can be avoided. It has a tendency to heat the head and cause discomfort, but it is mostly to be objected to in that it cuts off the wearer from outside sounds and limits his area of vision, giving him a feeling of isolation. Anything that is apt to cause nervousness in the

wearer, and thereby increase the rate of respiration, causes an unnecessary waste of both energy and oxygen.

The "Weg" apparatus has been introduced by Mr. W. E. Garforth as the result of many years' experience in rescue work, in which he has always taken an enthusiastic interest. In 1901 Mr. Garforth erected an experimental gallery, in which he reproduced as nearly as possible the conditions of a mine after an explosion by strewing the floor with broken stone from the ripping, and arranging props and broken timber to imitate mine falls. The whole gallery could be filled with noxious gases, and was fitted with inspection windows, to enable onlookers to see the exercises inside. Various apparatus have been subjected to severe and actual tests in this gallery with a view to discover their imperfections, and Mr. Garforth has collected most valuable data from the results obtained.*



Mr. Garforth's arrangement is the result of these experiments, and its chief feature is called by him "a lung-governing valve." He states that, as the action of the lungs is intermittent, the supply of oxygen should be the same, and that by this valve the supply of oxygen "is governed by the action of the lungs, in the same way that the supply of steam is regulated by the governor balls actuating the throttle valve of an engine." The mouthpiece is arranged something after the fashion of a dentist's bag for administering gas to a patient, and has the advantages of the helmet without its drawbacks, inasmuch as the ears and head generally are left quite free. One man wore this apparatus for three hours and ten minutes, during which time he walked and crawled about two and three-quarter miles, resting a little more than half an hour during this time. The writer is not aware whether Mr. Garforth's apparatus is yet being manufactured commercially.

A device that differs radically in principle from those previously mentioned is the "Pneumatogen," the invention of Prof. Dr. Max Bamberger and Dr. Friedrich Böck, of Vienna. In this arrangement no oxygen cylinders are used, the necessary oxygen being obtained by the reaction consequent on the exposure of sticks or "cartridges" of potassium-sodium-peroxide to the breath exhalations, the carbon dioxide and water being absorbed and oxygen given off. The apparatus thus generates its own oxygen as required, and has the advantage that an increased rate of respiration automatically increases the yield of oxygen. The absence of the oxygen cylinders very materially lessens the weight, and avoids the necessity for the numerous pressure-reducing and other valves that are a feature of the cylinder type apparatus. The whole thing is most compact and simple, very light, being only about one-fourth of the weight of the cylinder machines, and the first cost is not more than half. Its chief drawback appears to be the high temperature of the evolved breathing mixture, which, however, does not seem to cause discomfort. The makers admit the high temperature of the air supplied, but they claim it is dry and not uncomfortable to breathe, and they prefer to have it so rather than complicate the device by a cooling arrangement. The working cost of the "Pneumatogen" is somewhat higher than the cylinder type machines, but it is hoped, with an increased demand for potassium-sodium-peroxide, this will be considerably reduced. At present this compound is not manufactured on a large scale, and is in consequence rather dear. The "Pneumatogen" appears to be a decided step in the direction of simplicity and cheapness.

An arrangement of very recent date is the "Aerolith" liquid air breathing device, described within the past month before several of the mining societies of England by Dr. Simonis. It has excited favorable comment, but as yet no detailed description is to hand.

Enough has been said to show that there are at present available several devices of practical utility for supporting life in noxious atmospheres, but these devices are of no real use, and indeed are dangerous, unless the wearer is quite accustomed to their use. This state can only be obtained by regular practice under conditions as nearly as possible resembling those for which the apparatus is intended. Even with pure air to breathe, the work that has to be done by exploring and rescue parties after a mine explosion is most arduous, and to be really efficient the wearer of a breathing apparatus must have full confidence in it, and must have had sufficient practice to enable him to wear it with unconscious ease and without any fear of "funk." The provision of a practice room is, therefore, quite necessary, and it should be so arranged that it can be filled with unbreathable gases, and fitted with observation windows, through which to watch those practising. Only in this way is it possible to weed out those who, either from physical unfitness or nervousness, are unsuitable for the work. There is also a "knack" in breathing that must be learned in order to get the most efficient and economical work out of the apparatus and oneself.

On the continent and in England so-called "Rescue Stations" have been erected to serve a group of collieries.*

A typical building of this kind consists of a practice room as above described, an apartment fitted with racks for the proper storing of the apparatus and its accessories, where they may be kept in immediate readiness for use, a meeting or club room, and

*Note.—"Experimental Gallery for Testing Life-saving Apparatus." Trans. Inst. M. E. Vol. XXII., p. 169.

*Note.—"The work of a Joint Colliery Rescue Station." M. H. Habershon. Trans. Inst. M. E. XXI., p. 100.

dwelling rooms for a resident caretaker, who is also instructor. Gangs of colliery officials, and the more intelligent workmen, are systematically trained in such a manner that those acquainted with the intricacies of any one mine are not all of them underground at any one time. The gangs are composed usually of a captain or leader, whose sole business it is to direct operations. He can exchange pre-arranged signals by means of a pneumatic horn, or by waving lights, and he carries nothing else. He is the eyes and the ears of his party, who look to him for guidance. He has a deputy, or lieutenant, and the other three compose the rank and file. Discipline plays an important part in this work, and no time should be grudged to drill.

These parties can carry with them portable air stoppings, supplies of oxygen for the resuscitation of those poisoned by carbon monoxide, stretchers, etc. Their work would consist in the rescue of those who had survived the explosion, the quick restoration of the ventilation, and the obtaining of definite information as to the state of affairs underground. Generally they would act somewhat as the cavalry *vedette*.



DRAGER BREATHING APPARATUS IN USE.

Although too late to save any lives, breathing apparatus of the "Shamrock" and "Dräger" types, and several "Pneumatogens" were successfully used in the repairing and recovery of the mine at Courrières after the memorable explosion there. Just recently thirty-nine men were saved by the "Dräger" apparatus at the Redan Mine, Saarbrüc-ken, Westphalia. They were got out of the mine after the first blast. Later another blast occurred, which would certainly have killed them all, had not the presence of the breathing apparatus rendered it possible to rescue them.

The usefulness of the breathing device is not, however, limited to rescue work after explosions. They can be used to much advantage in the initial stages of a mine fire. Very often blinding volumes of acrid smoke render it impossible to approach what is only a small blaze, easily extinguishable at close quarters, but which speedily develops into a serious and uncontrollable fire. Equipped with these devices, men can penetrate the smoke and reach a point where their exertions will tell. In the case of gob fires also these devices should prove very useful.

Herr Meyer's paper on the actual use of the "Shamrock" apparatus at Courrières by the German Brigade will repay perusal, and is fully illustrated.*

A complete equipment of electric hand lamps is an indispensable part of a rescue station, for of course the ordinary safety lamp is useless under the conditions for which the rescue apparatus is designed. These lamps must be kept ready at all times for immediate use. The utility of all the apparatus in connection with a rescue station hinges on its readiness for use at a moment's notice. Explosions come unheralded, and time is then both life and money. The importance of this point is too obvious to need enlargement. Apart from the undoubted utility and additional safeguard that a properly arranged and equipped rescue station affords, the discipline and drill of the training process, especially when it is combined with instruction in first aid ambulance work, infuses a spirit of organization and *cameraderie* that should prove very useful in a time of emergency, particularly where one rescue station is the centre for a group of mines. Such an organization might very well be incorporated with, or might work in harmony with, the colliery fire brigades. Viewed in the light of an insurance premium, expenditure in this direction would appear well justified, merely from a monetary standpoint.

GRAPHITE IN CANADA

(From Our Special Correspondent.)

Although this mineral is in great abundance in the crystalline formation in this country, still until a few years ago little importance had been attached to its occurrences. The bulk of the world's supply of graphite is chiefly derived from Ceylon, and in a lesser degree from Bavaria and Austria, Siberia and the United States, but lately great attention has been paid to Canadian deposits. This is evidenced by the fact that not less than three big graphite mills are in course of construction, and this is specially due to the untiring efforts of some enterprising Americans.

The mode of occurrence of graphite shows great variety, affording quite a study in itself. Although the technical importance of the mineral has been recognized for a great many years, and although the study of the various occurrences has been facilitated by increased mining development, our knowledge regarding the geological position and origin is still imperfect.

In a general way we may distinguish in our Canadian occurrences two different modes of depositions, the vein-like and the disseminated. In the first mode of occurrence, that of veins, the graphite constitutes the filling of veins and cracks in gneiss, crystalline limestone, pegmatite and granular eruptive rocks. Both hanging and foot wall are easily discernable, and the direction of the vein is independent of the strike of rocks traversed. We find instances of this in the Grenville and Calumet deposits, near Buckingham and Templeton.

Though the vein form frequently occurs at most of the points where attempts to work the graphite have been made, and has shown in such cases a mineral of great purity, the uncertainty of such deposits is so great that the employment of capital on a large scale in this mode of occurrence would scarcely be warranted.

The disseminated variety is less desirable from a mining point of view than the vein-like occurrence, since it involves the handling of a very large quantity of rock, depending upon the percentage of graphite contained therein, in order to obtain the pure article. However, it must be mentioned that most of the successful mines in Canada have been working on deposits of this character, the vein occurrences as a rule being of too limited extent to render their commercial extraction lasting and profitable.

This disseminated variety occurs as scattered scales or plates through certain portions of the gneiss, limestone or other strata; it occurs often in proximity to veins, and in these cases it is

*Note.—"Experiences with the German Rescue Party at Courrières after the Explosion." Trans. Inst. M. E. Vol. XXXI., p. 575.

supposed that the graphite has thence been distributed along the planes and fissures of the rock in contact from the veins itself. This has been more particularly observed where the adjoining rock is a mica gneiss, but similar occurrences are also found in limestone and other rocks belonging to the older series.

The most important deposits which have been worked for many years are those located in the country north of the town of Buckingham. Here quite a large number of deposits show the disseminated variety, and, on account of the very large demand for flaky graphite—a grade which is mostly used in the manufacture of crucibles—the mines in that district have of late displayed great activity. In addition to the several mills which are being worked in the district, the Diamond Graphite Company,

The new mill building measures 72 x 26 feet square, and is fed from the mines by an inclined tramway. A new departure in the construction of this mill has been made by the division of the same into several sections, each section being driven by an electric motor. The motive power in the beginning will be steam, but later electricity will be generated at the big Lievre River Falls at Masson, at a distance of eight miles, and transmitted to the mine. The treatment of the rock will be as follows:—

The ore is first calcined in a roast kiln; it passes then through a Blake crusher, crushing rolls and sizing sieve, and, after it has been crushed for the second time in rolls, it is delivered to a series of Krom air jigs, which do the principal work by separating the flakes from the rock matter. The separated flakes then



BLACK LAKE, QUEBEC.

composed of New York capitalists, has almost finished a 100-ton concentrating plant, while another mill of the same capacity is in course of construction. The deposits which this company operates are situated five miles north of Buckingham, on the left bank of the Gatineau, and, although they have been known for a great number of years, still it seems that their great economic importance was overlooked.

The area which contains these large bodies of the disseminated variety, and which has been thoroughly tested by twelve-foot drills and much prospecting and development work, has the shape of a triangle, with side lines of 1,000 feet, 800 feet and 300 feet. The country rock is a rusty gneiss, which becomes schistose and laminated in the graphite deposits. The graphite rock, according to many tests, is supposed to carry as an average 12 per cent. flake.

pass through the polishing and sizing department, after which they are supposed to be ready for the market. It is believed that the mill can treat 100 tons in 24 hours, and that the output will range between six and eight tons of flake graphite per day (24 hours).

Another American company is operating in Calumet, a station on the Canadian Pacific Railway, just half way between Montreal and Ottawa. The graphite deposits worked by this company belong to both the vein-like and disseminated occurrences, the former having a width of from eight to eighteen inches. A shaft to a depth of eighty feet on the slope of a hill has been sunk on two veins, and it is reported that the latter, which consist of very fine graphite of the lamellar and columnar variety, exhibit a great regularity, both as to dimensions and their relation to the containing formation. At present a tunnel is being

driven from the foot of the hill towards the shaft; its total length is now 280 feet, while 50 feet more will be driven to reach under the present shaft. An upraise of 50 feet will ultimately connect the latter with the tunnel.

The big mill building measures 60 x 90 feet square, and is calculated to treat about 50 tons of graphite rock per day. A new departure in this mill will be made by the introduction of pebble tube mills, for the cleaning and polishing of the graphite flakes. The motive power in the beginning will be steam, but later electricity will be used, which will be generated from a water-power located four miles distant, on the Rouge River.

New discoveries of graphite have recently been made in the township of Amherst, in the north of Grenville, and it is reported that the deposits, which consist of the crystalline variety, are of large extent. Thus, on range VI., lots 15, 16, 17, about 12 miles from Jovite Station, a pit of 12 feet depth was worked in a vein 25 feet wide, the graphite raised being of an excellent quality. It is intended to build a mill on the property as soon as the snow goes off.

The Coals and Coal Fields of Alberta, Saskatchewan and Manitoba

By D. B. Dowling.

(Permission of the Director of the Geological Survey.)

(Toronto Meeting, 1907.)

Any description of the coal fields of the three Prairie Provinces, to be complete, would necessarily be lengthy, but the present paper is an attempt at a resume of the extent and character of the coals to be found there.

The rocks in which these coals are found all belong to the sediments of the cretaceous sea, and the coal horizons are in three successive portions of the period. Each one marks a time when the surface was not very much above the sea, but high enough to support a luxuriant flora. The history of the period seems to be as follows:—At the beginning of the cretaceous time, the land surface consisted of limestone beds which extended westward to the Selkirks. This began to sink along its western margin, concurrently with an elevation in the Selkirk region. This sinking went on to below sea level, but the subsidence was made up by a heavy deposit of sand and mud derived mostly from the elevated land to the west. This then gradually spread eastward, but was very intermittent, so that large land areas were formed and covered by vegetation. A great submergence beneath a muddy sea next occupied a long portion of the cretaceous time, but again the crust was sufficiently elevated to bring the muddy bottom to sea level. The western portion did come to the sea level, or above it, and coal deposits were formed; but it is not definitely known how far east they extended. One total submergence succeeded another, but for shorter time, before this new muddy surface rose above the sea for the last time; and again in its transition period coal beds were formed.

This threefold coal-forming period gives us three horizons in which to look for coal:—At the base, above the middle, and at the top of the cretaceous sea deposits.

The first we call the Kootanie, the second the Belly River, and the third the Edmonton, or Laramie.

In the three formations the quality of the coal varies under two fairly good rules. The first is that in the same district coals of the lower horizons, owing to age and pressure of the beds above them, should show a greater percentage of fixed carbon and also be more compact. The second is a general tendency to increase both the fuel ratio and the compactness in going toward the mountains, mainly on account of the increase in the thickness of all the deposits in that direction, and thus in the load over the seams. The fuel ratio is the fixed carbon, divided by the volatile combustible matter, and the term porosity is here taken to mean the percentage of water absorbed by the coal.

Kootanie Measures.

The lowest horizon is exposed in the raised and tilted blocks of the crust shown in, and in the neighborhood of, the Rocky Mountains. The quality of the coal, as given by the fuel ratio, varies considerably; and from a number of analyses the following notes will show the general range:—

In the Elk River region the variation shown at Morrissey ranges from 3.2 to 6.12. At Fernie the ratio increases from 3.22 to 4.60 in the lower seams. At Michel two seams differ slightly, the ratios being 3.5 and 3.7. The eastern outcrop of some of these seams on Marten Creek evidently show less change in the physical structure as the ratio falls from 2.08 to 1.86. In order to bring all the areas under notice, lists are added, giving full rate and thickness of seams, arranged in order of hardness. The areas within the mountains may briefly be outlined as:—

(1) The Elk River basin, with 22 workable seams containing 216 feet of coal. This, with a slight gap, extends north to the head of Elk River.

(2) Crows Nest areas, several narrow blocks known as the Coleman-Blairmore areas, with 21 seams and 125 feet of coal, and extending north, ending with the Sheep Creek area in front of Mount Rae.

(3) Moose Mountain area, south of Morley, with 2 seams, 7 and 8 feet respectively.

(4) The Cascade area, running from the mountains north of the Elbow River northward to near the Saskatchewan, having mines at Canmore and Bankhead. In the vicinity of the Bow River there are 10 to 14 workable seams, and 75 to over 100 feet of coal. Its extension north of Red Deer River has 15 workable seams, with 114 feet of coal.

(5) Palliser area, on Panther Creek, east of Cascade coal basin, several seams known. Area not extensive.

(6) Costigan area, on Panther Creek; five seams known, with 27 feet of coal.

(7) Bighorn area, running from Saskatchewan River north to past Brazeau River; only about 5 seams yet located, largest 16 feet.

Other areas in foothills, or farther north, not yet discovered.

The Kootanie coals are all so well compacted that less than 2 per cent. of water, as a rule, is absorbed by any. Their porosity is not considered in the list which here follows, but they are given in order of hardness.

List of Kootanie Coals by Fuel Ratio.

Locality.	Fuel ratio.	Thickness of seams examined	
		feet	inches
Anthracite, Alta., seam A.....	11.59	7	0
Marsh mine, lowest seam.....	8.79	4	0
Bankhead mine, seam No. 2.....	7.98	8	0
Cascade River, old workings	7.50	4	0
Palliser area, Panther River	7.89	5	0
Palliser area, Pantheir River	7.30	2	0
Marsh mine, from old tunnel	7.23	12	0
Canmore, seam No.	7.10	5	0
Costigan area, 2nd from top	6.97	4	0
Marsh mine, seam above tunnel	6.92	4	0
Sheep Creek, 1st seam opened	6.92	8	0
Canmore, Alta., seam No. 1.....	6.61	5	0
Sheep Creek, higher seam	6.49	8	8
Marsh mine, upper seam	6.54	10	0
Morrissey, lower seam	6.12	18	0
Canmore, seam No. 4.....	6.00 to 5.35	3	0
Marsh mine, highest seam	5.95	15	0
Costigan, seam eastern outcrop	5.84	4	9

Locality	Fuel Ratio	Thickness of seams examined feet	inches
Costigan area, lowest seam, west outcrop	5.79	11	0
Sheep Creek	5.76	10	4
Coxcomb, Mt. Jumping, Pound Creek.	5.75	3	0
Canmore, Alta., seam No. 2	5.37	4	0
Canmore, Alta., seam No. 5	5.34	5	0
Thorne mine, Moose Mountain	5.15	7	6
Canmore, seam No. 6	5.06	4	6
Costigan seam, western outcrop	4.89	4	9
Costigan area, 3rd seam from top	4.85	3	9
Costigan area, 4th seam from top	4.83	3	6
Fernie, B.C., lowest seam	4.60	22	0
Moose Mountain, outcrop of seam	4.05	5	0
Sheep Creek, Moose Mountain seams.	3.65	3	0
Snow Creek, Panther River, Cascade area	5.36	5	0
Michel, B.C., lowest seam	3.70	10	0
Michel, B.C., highest seam	3.50	15	0
Fernie, Mine No. 3	3.49	6	0
Fernie, Mine No. 1	3.41	9	0
Fernie, Mine No. 1	3.22	8	0
Morrissey, B.C., highest seam	3.20	18	0
Elbow River, branch west of Moose Mountain	3.12	5	4
Oldman River, 1 1-2 miles east of gap	2.92	5	0
Saskatchewan River, opposite Bighorn Range	2.79	5	0
Elk River, head of	2.71	13	0
Oldman River, N.W. branch, North Fork	2.70	8	0
Oldman River, South Fork	2.47	9	9
Branch of Brazeau, Bighorn Range	2.37	16	0
Marten Creek, Jubilee seam	2.08	30	0
Oldman River, near gap	1.90	5	7
Marten Creek, B.C., Peter seam	1.86	14	0
Marten Creek, B.C., small seam	1.61	2	0

BELLY RIVER MEASURES.

The middle horizon is exposed in the foothills, where it is brought up by a general rise toward the mountains. This is known only in small portions, and provides a good grade of very compact lignitic coal.

Under the surface of the plains it is disclosed along the deep excavation, or trough, through which the branches of the South Saskatchewan flow. A slight roll in the measures, running in the general direction of the Coteau, exposes these measures north of the surface depression of the South Saskatchwan, and beds are recognized to near the Vermilion lakes, a short distance south of the North Saskatchewan. In this northern extension little coal has yet been found, and eastward the measures are covered by higher beds, due to a slight depression of the beds in that direction. The interesting feature of the eastern extension of the formation, is its possibility of carrying coal into the central portion of Saskatchewan. Such occurrences of loose lignite near Prince Albert, and a seam reported on the face of the hills between Montreal Lake and Lake la Ronde, as well as in the bed of the Saskatchewan, above Saskatoon, appear to be encouraging. The fact that boreholes near Carlton and the Elbow of the Saskatchewan have not revealed seams, may mean only that the drilling began below the coal bed. The seams of the Lethbridge area are not numerous, the coal mined there being only about 5 1-2 feet. At other places near by the thickness does not appear so great. Near Medicine Hat a five foot seam was worked, but the coal appears to be very porous and carries a high percentage of water.

The horizon containing most of the coal is in the upper part of the formation, and thus separated by about 1,000 feet of shales from the lowest coals of the highest horizon. So that the border of the recognized areas of Belly River rocks are marked by coal seams.

Comparisons of the fuel ratios in the Kootanie coals give us what might be called a scale of their hardness. The same comparison in the fuels of the upper horizons show only the degree of alteration that has taken place in them during their change from vegetable matter toward the more stable condition as coals. They all show, in a marked manner, that their substance has not been so compactly pressed, as they all absorb much greater percentages of water. The Belly River coals are slightly denser than the Edmonton coals of the same district, but it is not until the seams outcrop near the mountains that this character is well marked.

In the western upturn they carry less than 3 per cent. of water, while the Edmonton coals run from 3 to 7 per cent. For the Lethbridge area the difference is not so strongly marked, except at one or two localities.

COALS OF BELLY RIVER FORMATION IN WESTERN UPTURN OR FOOTHILLS.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Head of Mill and Pincher Creeks	2.96	1.99	8	9
Mill Creek, 4 miles above mill	2.02	1.63	8	0
Sheep Creek, Tp. 19, R. 4, west of S	1.62	2.16	5	0
Sheep Creek, Tp. 19, R. 4, west of S	1.57	2.50	7	0
Morley, on Indian Reserve	1.18	1.26	6	0

COALS OF BELLY RIVER FORMATION IN LETHBRIDGE AREA.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Taber Coal Co	1.83	10.8	3	3
McPhee Mine, near Taber	1.72	11.35	2	7
10 1-4 miles above Medicine Hat	1.62	17.70	4	0
Belly River, Driftwood Bend	1.40	9.18	3	3
St. Mary River, 7 miles from mouth	1.38	7.02	3	8
10 miles from Medicine Hat	1.38	16.82	4	0
Bow River, Grassy Island	1.34	11.96	4	6
Red Deer River, 9 1-2 miles below Bull pd	130	13.06	3	6
Milk River Ridge, north side	1.32	5.58	3	0
Lethbridge, main seam	1.26	6.50	5	6
Stair, main seam	1.25	20.54	5	0
Red Deer River, 4 1-2 miles below Bull pd	1.15	13.63	1	6
Red Deer River, 2 miles below Bull pd	1.19	12.62	1	3

LARAMIE—EDMONTON COAL AREAS.

The larger coal areas of both Alberta and Saskatchewan are of the formations and are practically on one and some same horizon which occupies the dividing line between sea deposits below and fresh water and land deposits above. Some of the coal seams are in the upper fresh water stage—the top of the Laramie; but the majority are in beds separated by sands and clays, holding remains of organisms which lived in brackish water—the Edmonton, or lower Laramie. In Saskatchewan the divisional lines between these deposits are not worked out; but in Alberta, the beginning of fresh water stage is drawn at about the horizon of the Big Coal Seam on the Saskatchewan. The formation originally probably covered a very large area, but the uplift of the western edge, and the subsequent denudation of a great part of the plateau formed of these soft beds, has left remnants only of the upper coal rocks. In Saskatchewan these remnants occupy the high lands in the Cypress Hills and Wood Mountain and a triangular area eastward from the Coteau.

A great excavated depression running outward from the mountains, branching to north and south of Cypress Hills, separates them from the plateau running north and south and sloping eastward from the foot of the mountains. The western coal area occupies a belt near the eastern edge of this slope, narrow at the south, but widening northward, reaching its maximum in the latitude of Edmonton. The coal rocks are then covered farther up the slope by heavy beds of sandstone, but emerge from under them along a narrower band just in front of the foothills in some parts, and in others, generally in the south, nearer the mountains. There is thus one part of the field which has suffered much pressure, and in this the coals show the effect of the compression. The thickness of the seams in this area appear to increase to the north. Thus, in the vicinity of Bow River, seams of 4 1-2, 6 and 9 feet are the best that are known; but in the vicinity of the Saskatchewan, seams of 8, 18, 4 and 6 feet occur near Edmon-

ton and at the Pembina River; the horizon of the Big Seam shows 3 seams, 13, 13 and 6 feet, or 32 feet of coal.

In the Saskatchewan areas, the coal seams of the Cypress Hills and eastward to Wood Mountain, are all thin; but a 4 foot seam south of Cypress Hills may prove fairly persistent. In Wood Mountain two seams of 6 and 8 feet respectively will probably be utilized. On the eastern side of the Coteau at the Dirt Hills, three seams, 7, 3 and 6 feet, are reported. In the Souris district seams of 5 and 8 feet are being mined, the latter reported as thickening to 15 feet toward the east.

In the following list, which is here, for uniformity, arranged as the others in order of fuel ratio, the porosity runs somewhat at variance with this scheme; but if the arrangement had been by porosity only, a regular progression from west to east would have been more nearly secured, since all the coals absorbing water from 3 to 7.1 per cent. actually come from the beds in the disturbed western part of the field. All those absorbing from 8 to 14 per cent. are from the eastern portion of the Edmonton field, while all with a porosity of from 14 to 22 per cent. are from the Saskatchewan areas.

List of Laramie and Edmonton Coals in Order of Their Fuel Ratios.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Shaw's Coal Mine, Fish Creek..	1.66	3.76	2	0
Blackfoot Reserve, 6 1-2 miles below Crossing	1.6 to 1.5	12.31	4	8
Big seam, Saskatchewan River..	1.6 to 1.3	11.14	18	0
Indian Farm, Pincher Creek	1.58	5.38	3	0
North Fork, Highwood River	1.56	6.12	1	6
Athabaska River, above McLeod River	1.53	10.58	3	0
Athabaska River, above McLeod River	1.49	11.47	10	0
Edmonton, just below town	1.49	12.89	6	0
Pembina River, Tp. 53 R. 7 west of 5th lowest	1.48	13.07	6	0
Pembina River, Tp. 53 R. 7 west of 5th highest	1.47	13.78	13	0
Red Deer River, in foothills	1.46	4.97	9	0
Rocky Mountain House seam	1.45	7.01	2	0
Red Deer River, 4 miles below Tail Creek	1.41	10.02	5	11
Red Deer River, mouth of Rosebud	1.40	13.08	6	0
Battle River, Meeting Creek	1.39	11.68	4	6
Sheep Creek Coal Mine, Lineham P.O.	1.38	3.08	4	0
Coal Creek, west of Cochrane, Alta	1.38	4.93	4	6
Edmonton, The Ross seam	1.34	11.47	4	0
Red Deer River, 12 miles above Tail Creek	1.33	7.66	7	0
Knee Hills Creek	1.33	9.86	4	0
Crowfoot Creek, 4 miles from Bow River	1.33	11.25	6	0
Bow River, 4 miles below Blackfoot Crossing	1.31	10.72	8	11
Big Island, 12 miles above Edmonton	1.30	8.92	3	8
Egg Creek, near Victoria, Alta.	1.24	11.91	1	1
Borehole, on Souris River, east of mines	1.26	17.78	6	0
Dirt Hills, upper seam	1.24	14.80	7	0
Dirt Hills, lowest seam	1.24	15.50	6	0
Dirt Hills, middle seam	1.11	17.53	3	0
Souris River, mouth of Short Creek	1.10	21.84	5	0
Long Creek, 1 mile north of Wood End	1.08	15.11	7	0
Bow River, three miles south of Horseshoe Bend	1.06	11.13	4	6
Poplar River Tp. 1, R. 28, west of 2nd	1.01	12.05	18	0
Willow Creek, south of Cypress Hills	1.05	16.37	4	0
Wood Mountain, lowest seam	1.04	12.26	8	0
Wood Mountain, Hay flat	.99	13.73	6	0
Wood Mountain, Upper seam	.96	18.61	8	0
Turtle Mountain, from locality in Dakota	.90	13.98	..	..
Long Creek, opposite Estevan	.63	17.97	6	6
Long Creek, near Wood End	.70	14.73	7	0
Big Muddy Creek, south of Willow Bunch	.58	16.28	5	0
Big Muddy Creek, south of Willow Bunch	.55	15.51	4	0
Big Muddy Creek, south of Upper seam	.54	15.20	3	0

THE SUPPLIES AND RESERVES OF IRON ORES

By John Birkinbine, Philadelphia.

(Toronto Meeting Canadian Mining Institute, 1907.)

In technical publications and in trade journals attention has been given lately to the probable exhaustion of some mineral products, and it is proper that this be considered seriously, for in all business enterprises the important question of supply and demand should receive careful study. The fact that the minerals discussed are nature's products does not suggest a different treatment from others obtained artificially.

The weather conditions which affect agriculture are features in determining the probable supply of and demand for grain, etc., each season or year, but the supplies of the minerals of which this paper treats are considered by decades or by cycles of years, for they are not reproductive. The reserves for the future exist to-day, and the problem to be determined is for what length of time these mineral reserves may be expected to supply the demand.

Progress in all metallurgical lines has been rapid, outputs of minerals and production of metals doubling and trebling in a few years, and these augmented quanties have directed attention to the problem of securing a practically permanent supply of raw materials. The question as to the time when the coal beds of the world, of different countries, and of portions of countries, will be exhausted has often been presented, and the rate at which forest areas have been denuded has directed attention to the supply of timber and vegetable fuel being curtailed.

Enormous increases in the use of copper, due primarily to the phenomenal development and utilization of electrical energy, have caused some writers to anticipate that in the near future there may be a shortage of this metal, and the probability of a scarcity of the precious metals has also been prophesied. Tremendous strides in the manufacture of iron and steel, the great combinations formed for the manufacture of these metals, and the purchases or leases of large mineralized areas have brought prominently into notice the possible exhaustion of the iron ore supply.

Some of the discussions have apparently been based solely on an assumption that if a certain rate of increment has been maintained for a specific time, that this rate will be continued, and then the calculation is simple, viz., to the known amount of material now mined, add percentages representing the increased demand for a term of years, and use this as a factor to learn how long the apparent supply will continue. But in any discussions of these problems many features must be taken into consideration.

In all mineral deposits we must face their ultimate exhaustion, because they are not reproductive, at least not to an extent which would make such reproduction appreciable in the supply and demand. In the forests different conditions prevail, but

even there the rate of accretion is limited, for trees only mature after a number of decades. This, however, permits of judicious protection and propagation, and the growing appreciation of forestry gives promise, if the interest is maintained, of a supply of timber which, though restricted, may be depended upon.

Among the features which demand attention in determining the probable exhaustion of supplies of minerals are the methods employed to win them, many of which are and have been wasteful. Mining in years past, and, in some localities, at the present time, removes the better mineral only, leaving the less desirable in the ground or consigning it to the waste heap, often mixed with refuse material.

A second factor to be considered is the composition of the mineral, for only occasionally are metals found in the metallic state. Nuggets of gold are not uncommon, placers yield gold in metallic particles; lumps and even masses of native silver or copper occur, and galena is fairly abundant, but, although aggregating large quantities, these represent but a small portion of the total metal marketed. Iron in a metallic state only occurs as meteorites, but the aggregate known weight of these hardly amounts to one hundred tons.

As a rule a number of metals or elements are combined in the mineral won from the earth, and the influences of some of these components are deleterious, especially for particular uses; consequently an ore, rich in a given mineral, may be much lessened in value for present use by reason of the association in which the metal is found. But in determining the possibilities of exhausting the supply of any natural product, it is unfair to assume present practice and knowledge as limiting the use of the metal under consideration. Methods of treatment, or of beneficiating may bring into demand metallic ores which now are considered undesirable.

Taking the supply of iron ore as the subject for this paper, it must be admitted that in many localities ore has been rejected in the mines, or casts on roads or dump piles, superior to other ores which are successfully used elsewhere. This leads to the natural assumption that the deposit was wrought before its product was required, or that it was not judiciously operated, or that to reach points of consumption the mineral had to stand excessive transportation and handling charges.

In the early history of the iron industry of America the initial enterprises were developed by plants using ores, few of which to-day would be accepted as desirable. The prices received for pig metal were far in excess of what is now commanded, and the cost of production was relatively high, but the progress made in technology, and the improvement in equipment and practice which are responsible for the enormous development of iron manufacture may go far towards overcoming the objection to these now discarded minerals.

Beyond the use of ore, fuel and flux fed to vertical furnaces in which air blast accelerates combustion, there is slight similarity between the production of iron now and seventy years ago. May we not expect as radical changes in the future?

During the first visit of the Iron and Steel Institute and the Verein Deutscher Eisenheutenleute to the United States in 1890, the delegates were divided into two parties, one going north into the Lake Superior Region, and one south to Alabama. It was the writer's privilege to explain to those taking the northern trip that they were walking on a road largely composed of discarded ore, higher in iron, and lower in phosphorus, than their colleagues were contemporaneously examining in Alabama. To-day such ore is not cast into roads, but is shipped, and this shipment is profitable because of the perfected mining, handling and transportation facilities which prevail in the Lake Superior Region, and because of modern metallurgical processes.

A third factor is quantity, for the demands of a single industrial plant for a day are now as great as that of an original plant in a year's time, and the apparent extent of a deposit receives consideration not required in former years. Numerous iron ore mines which have been wrought are now abandoned and lie dormant, not all of them because of leanness of ore or of their composition, but because a number of mines would have to be combined and operated to make a material increment in the supply for a modern iron and steel industry. Most of these deposits had been used locally, but it is not improbable that a combination of several under efficient management would permit of operating them successfully, and delivering the materials to consumers by modern transportation methods at satisfactory cost.

A fourth factor is the utilization of metallic alloys and the possible substitution of other metals for specific purposes. In constructions the modern tendency is to study strains and forces, and prepare designs to secure the best distribution of material. Steel and concrete largely displace wood and brick buildings, but each member of a structure, vessel, machine or tool, is carefully calculated to reduce the weight or quantity to a minimum. If we employ wasteful metohds in mining, in smelting, and manufacture, and apply masses of metal rather than well proportioned parts, if we fail to make use of improved forms and combinations, we may expect to pay the penalty.

As to the future supply of iron ores, a number of papers written by gentlemen who are considered either as local or national authorities, indicate a tenor of anxiety, or phophesy the exhaustion of the iron ore resources of the world. It may be presumptuous to take exception to the opinions of these authorities, but the writer fails to find justification for many of the conclusions stated.

A geological survey is considered an essential feature for any progressive government, whether national, provincial or state, and a large number of academies and colleges educating the youth, teach the elements of geology, while the search for mineral wealth has encouraged the pioneer and the prospector to penetrate into the mountain fastnesses and wildernesses of all countries. But who of these is willing to assume that the world has anything like a complete knowledge of the earth's crust and its mineral wealth?

"The unexplored regions of the earth" is the caption of a recent magazine article by Mr. Cyprus C. Adams, which is illustrated with a series of continental maps, indicating by shaded areas the *terra incognita*. This shows graphically how much of the earth's surface is unexplored, and the author states: "Unknown regions have wholly disappeared only from the map of Europe. Its entire surface has been scientifically explored, though much detailed research remains to be made. Its map is approximately correct, and we have a very large, if not complete, knowledge of its material resources. . . Many years will elapse before any other continent is as well mapped as Europe. . . and a large amount of pioneer work still invites the explorer, for many of the unknown areas have much territorial extent."

As to the North American Continent, the statement is made that: "Archæologists say that their branch of science requires the exploration from their special point of view, of most of Western North America, from Nevada to the Arctic; but they cannot enter parts of this area without cutting into regions that have never yet seen an explorer. . . Official surveys in Canada have in fifteen years reduced the unexplored areas more than one-half. . . parts of Alaska aggregating an area six times as large as that of New York are still unmapped and practically unexplored."

There is scarcely a mining district which fails to show instances of early exploitation, abandoned because it was believed to be unproductive, but subsequently developed into important producing mines. The story of mines yielding good mineral, but which were conisdered as approaching exhaustion, being galvanized into new life by the discovery of parallel veins or deeper lenses is repeated, even in the older mining centrs. Giving full crdit to the ubiquitous prospector, to the energetic geologist who spends months in the field, and to the mining engineer who explores

ahead of his working, can all these claim to have done more than "scratch the surface?" If not, we must believe there are in the earth many deposits of value now unsuspected, or at least not located by research. Some deposits of iron ores, passed by because they are lean, or by reason of the phosphorus, sulphur, titanium, etc., which they carry, offer inviting fields for experiment by chemists and metallurgists, for these valuable allies of the iron industry have assisted in making some minerals which would otherwise be condemned take place among those which are desirable. It is evidently unfair to eliminate from the list of iron ores those which carry considerable titanium without giving credence to the investigation of, and experiments with, electric smelting made by the Dominion Government, or the exhaustive and conscientious work of Mr. Rossi. It would be equally unfair to cast aside a highly sulphurous iron ore without considering what could be done by roasting, nodulizing, and, in some cases, separating. Nor are we justified in designating a highly phosphoric ore undesirable until the possibility of separating this magnetically, or with jigs, is considered, the utilization of the mineral to produce basic or foundry pig iron tested, and the possibility of value from the phosphate extracted determined. Some silicious ores formerly rejected, but which now are sought for to mix with less silicious minerals, form another illustration.

The largest iron and steel producer in the world, having enormous reserves, has lately added to these by entering into a lease whereby it has the privilege of mining large quantities of ore from the lands of a transportation company, and the liberal rates agreed upon for transportation to upper lake ports and for royalty, has influenced the general belief in the possible exhaustion of iron ores. This contract starting with the year 1907, provides for mining at least 750,000 tons of ore during the year, and paying therefor $1.65 per ton, on which, at existing transportation rates, 85 cents may be considered royalty on ore yielding 59 per cent. of iron when dried at 212 degrees Fahrenheit. The contract also provides that in each year thereafter the quantity mined is to be increased by 750,000 tons or more, and the royalty advanced 4 per cent. For the year 1917 the minimum tonnage will be 8,250,000 tons, and the rate paid $1.90. Thereafter at least an equal amount of ore (8,250,000 tons) is to be taken out annually, but the 4 per cent. increase in the charge for royalty continues, so that in 20 years the rate will be $2.33 per ton, and in 40 years $3.00 per ton will be paid for freight to docks and for royalty. This contract demonstrates that for at least 40 years a demand for metal is expected, and as the agreement continues until the mines are exhausted, a continued advance in value is looked for.

That this lease would have a decided influence upon the iron ore trade generally was to be expected. A resume of its terms shows that for the

	Total which must be mined.	Royalty and Freight per ton.
1st 10 years	41,250,000 tons.	$1.65 to $1.96
2nd 10 years	82,500,000 tons.	1.99 to 2.30
3rd 10 years	82,500,000 tons.	2.33 to 2.64
4th 10 years	82,500,000 tons.	2.67 to 2.98

But this contract does not necessarily indicate exhaustion of the iron ore supply of the United States, it rather insures a convenient and desirable supply of raw material to plants already in operation, or under construction, where the operating company has large investments. Believing that it has a market at its own furnaces for all the ores which it can produce, the contract insures the industry a continuous supply. The lease also eliminates a possible competitor with extensive mineral properties, large capital, and an assured market for manufactured steel.

The writer lays no claim to personal familiarity with the iron ore deposits in all countries, and is willing to concede to geologists, statisticians and metallurgists of other nations a knowledge as to details which he does not possess, but an association with the United States Geological Survey for two decades brought him in correspondence with all the iron ore mines in the United States, and professional investigations of iron ore deposits in various parts of the United States, Canada and Mexico has aided him in judging the North American reserves. Correspondence extending over a number of years with specialists, and a careful study of published data, have also added information concerning the deposits which are available in other countries.

Examination of the various articles and papers which have appeared concerning the iron ore reserves, show that some are evidently influenced by patriotic feelings, or affected by the intimate knowledge one has of his own country. As an instance, the table presented by Prof. Tornebohm, of Sweden, may be cited. This table credits to various countries the following iron ore reserves:—

Countries.	Workable Ore Fields, million tons.
United States	1,100
Great Britain	1,000
Germany	2,200
Spain	500
Russia and Finland	1,500
France	1,500
Sweden	1,000
Austria, Hungary and other countires	1,200
Total reserves	10,000

This table is not offered to criticize Prof. Tornebohm, nor to emphasize the national bias which may be expected to prevail, nor is it presented with any intention to be unfair to other countries, for the writer's basis of estimation may be open to similar criticisms in so far as the reserves of North America are concerned. An honest endeavor has been made to keep fairly within limits, for the purpose of this paper is a frank discussion of the iron ore resources of the world. If we are facing in the near future, or at any time, exhaustion of an important natural resource, the sooner this is appreciated the better.

Crediting Professor Tornebohm with superior knowledge of European ore deposits, and also of those from Asia and Africa, which have been drawn upon, his presentation of the problem may be discussed from the American standpoint. The estimated reserves allotted to the United States, 1,100,000,000 tons, are less than have been commonly credited to the Lake Superior iron ore region alone. One estimate given currency in the past year puts the total for this district above 1,500,000,000 tons, and the lease above referred to is generally accepted as covering a tonnage equal to 40 per cent. of the reserve allotted by Prof. Tornebohm to the United States.

Professor Tornebohm's figures for the United States are made up of 1,000,000,000 tons for the Lake Superior region, 60,000,000 tons for Alabama brown hematites (this omits any consideration of the red hematite deposits—the principal reliance of the Alabama-Tennessee furances), with 40,000,000 tons left to complete the total of the unmined ores in New York, New Jersey, Pennsylvania, in all the Southern States (except brown hematite mentioned), and the ores of all Western States, including Wyoming, Colorado and New Mexico, where iron ores are now won.

In criticizing these quantities, some vague optimistic statements have appeared which are not answers to the Swedish figures, and do more to befog than to clear the situation of uncertainty.

The writer had, while representing the United States Geological Survey, unusual facilities to be posted as to the iron ore reserves of the United States, but he has hesitated to offer estimates on these, because the more the subject is studied the more favorable the outlook for the future appears, and he merely suggests the following:—

If Professor Tornebohm's estimate of the United States is incorrect we may question his estimates for other portions of the world, at least those outside of Europe. The Swedish professor credits his own country with ores of high metallic contents and with ore reserves equal to those of Great Britain, twice as great as for Spain, nearly as much as for the United States, two-thirds as large as for either Russia and Finland, or for France. This

may be accepted as due to a more intimate knowledge of the enormous deposits of his own country and not to a desire to minimize those of other lands. If his total of 10,000,000,000 tons is accepted as representing the ore reserves of the world, his apportionment of these must also be accepted, which is as follows:—

	Per cent.
Germany	22
France	15
Russia and Finland	15
United States	11
Great Britain	10
Sweden	10
Spain	5
All other countries, including Austria-Hungary	12

On this basis Europe would possess more than three-fourths of the iron ores of the world.

He is certainly not optimistic concerning the United States, nor do his figures apparently recognize the known deposits of iron ore in Newfoundland, Canada, Mexico, Cuba or South America. He makes small allowance for Asia, with known iron ore deposits in China, Japan, India, and in the Pacific islands. Nor does he give sufficient credit to the geological reports of Australasia, nor allow for ore reported as existing in quantity in the great continent of Africa.

Of his total reserves 7,700,000,000 tons are given to Europe, 1,100,000,000 tons to the United States, and but 1,200,000,000 tons to Austria-Hungary and other countries, which include all of Asia, Africa, Australasia, the Pacific islands, Cuba, South America and North America, outside of the United States. The limited exploitation of Canadian iron ores is evidently assumed as a basis for calculating the reserves, instead of the researches made by the Canadian Geological Survey and individual investigators.

Canada is not mentioned, but is included in "all other countries," attached as an appendage to Austria-Hungary. The known deposits of iron ore in the Dominion are believed to exceed those of Austria-Hungary, and but few of these have been exploited. The possibilities of the British possessions in North America are vast, and they may be confidently expected to outrank as iron ore producers some of the countries specifically named.

The prophecies of exhaustion of iron ore depend for their fulfillment on a practical continuance of existing conditions, such as the relative location of iron ore producing mines, iron ore consuming plants, coal deposits and coke ovens, moderate changes in labor conditions, labor saving or transportation facilities ceasing to improve, manufacturing and industrial centres being mainly limited to those now recognized, on little, if any, progress in the metallurgical processes. Moreover, such prophecies omit the possibilities of other metals or alloys being procured at a cost competing with iron at or near present prices.

Had the iron-master of half a century ago been informed that in 50 years the production of iron would reach the quantities now annually made, and had be believed this otherwise possible, he would have prophecied that sufficient ore could not be found to produce such an enormous output, and he would have expressed doubt as to the possibility of obtaining fuel to smelt the ores or of assembling the necessary raw materials at blast furnaces.

If we are to estimate the iron ore reserves for future use, we must also consider their utilization, which we have no right to assume will be kept within the limits of present industrial development or transportation facilities, nor even confined to prevalent methods of metal production. They are also to be estimated in their relation to the coal reserves if the metallurgical processes of the present are to be followed. Such considerations may make available some ore deposits which are now remote from commercial centres or distant from exploited coal fields, for unless we assume that there are to be no further advances in this particular the utilization of various coal deposits and of iron ores convenient to them is to be anticipated.

The practicability of electric smelting of iron ore, which has been the subject of detailed study and report in Canada, may be of importance in the future, especially in the treatment of ores whose composition or physical condition are in the present status of knowledge, undesirable for us in the blast furnace, and experiments with iron sands by the United States Geological Survey offer a possible reserve of iron ore of considerable importance. The same resource, ability and skill which have brought the iron and steel industry to its present status may be counted upon to overcome many objections to ores which are impure or distant, and, with new metallurgical methods, ores now avoided because of elements in their composition, may be in demand.

It is well known that some iron ore deposits are removed from present or immediately prospective transportation facilities, are distant from fuel, are lean, and must be beneficiated. But when we remember how iron ores of the Lake Superior region have been the incentive to gridiron that section with railroads and to build an enormous inland marine, equipped with loading and unloading facilities second to none, distance becomes comparatively unimportant where ores are conveyed by boat for less than a mill per ton mile, and where long railroad hauls can be provided at 3 mills per ton mile. Under such circumstances ore can be carried to fuels or fuels to ores, or the two can meet at desirable points at costs which need not be prohibitive.

The liberal use of Swedish, Spanish, African and other foreign ores by European and American furnaces, and the large proportion of the ore supply of the United States and Canada coming from the Lake Superior region, illustrate how transportation facilities affect the locality of supply. So beneficiating, modern mining methods, or economics in mechanical appliances, permit lean ores to be mined, roasted, comminuted or separated at small cost. In the existing stage of mining and mechanical development, and with the study which has been devoted to labor-saving appliances, transportation facilities, methods of beneficiating ores, etc., the leanness of ores and present distances from points of consumption, are not to be given too much importance.

Using the lease before mentioned as a basis, we may assume that transportation costs will decrease rather than increase, and accept the present rate as fairly covering this item. Deducting, therefore, 80 cents from the rates fixed, the royalty or apparent value of the iron ore in place is expected to advance from 85 cents to $1.16 per ton in the first decade, from $1.19 to $1.50 in the second decade, and from $1.87 to $2.18 in the fourth decade. In other words, if the lease continues, and the ore lasts forty years, its value in the ground will be nearly trebled.

Accepting, for the purpose of discussion, this increment of value, there would seem good reason for exploiting a number of iron ore deposits which are now inactive, because of their character or location. The convenience of using ores rich in iron and the facilities for obtaining such material as wanted by purchase, have encouraged the transportation of desirable mineral over long distances to furnaces close to which relatively inferior ores lie unused. The freight added to the selling price of these more desirable ores in some instances brings the cost of producing pig metal above what may be expected by using relatively inferior and cheaper local ores.

It is hardly equitable to compare ore reserves on the basis of what is esteemed as desirable by the present practice in various countries. Thus, in the estimates made by Professor Tornebohm for the Swedish Government, he credits Great Britain with as much ore as he allots to the United States and Germany, with double that quantity of iron ore for future use; but for the United States he assumes a yield of from 45 to 67 per cent., and for Germany from 30 to 45 per cent. In other words, the estimated 1,100,000,000 tons for the United States is all treated as of a grade superior to the richest of the British or German mineral. Dividing the ore reserves by the percentage of iron, Professor Tornebohm allots to the various countries the following:—

	Tons of Metallic Iron.
United States	603,166,600
Great Britain	295,000,000
Germany	825,000,000
Spain	249,375,000
Russian and Finland	637,500,000
Sweden	611,538,460

(This statment was prepared by Mr. Chas. K. Leith.)

Germany is thus given pre-eminence as an iron producer, and Russia and Finland, Sweden and the United States are placed next in order, followed by Great Britain and Spain. The difference in labor and transportation costs in the various countries or districts will permit those where these items are relatively low using lean ore at a profit. But, if necessary, the United States could utilize, and some plants are now smelting, mineral closely approximating the yields of iron mentioned as employed in Great Britain and Germany.

The papers and discussions upon the probable exhaustion of iron ore supplies serve a good purpose by awakening interest in a subject of importance to all who produce, manufacture or use iron or steel. Results to be anticipated from such discussions are: That known deposits of iron ore classed as undesirable by reason of location, apparent volume, physical structure or chemical composition, may receive consideration; that some ore bodies, now unopened, may be exploited, and that mines which have been wrought in the past may re-enter the list of producers, while encouragement to develop new sources of iron ore may come from the discussion.

The fact that a number of ores considered unattractive by blast furnace managers can be made available, has received less attention than would have been given had the better ores been more troublesome to obtain. But roasting pyritiferous and other ores has been followed for many years; more complete desulphurization and nodulizing of comminuted sulphurous ores is now practiced on a commercial scale; a large tonnage of magnetite is passed through magnetic separators, to reduce the silica or phosphorus contents; and practical demonstration has shown that titaniferous iron ore, when properly fluxed, may be economically smelted, while electrical smelting is being thoroughly investigated. The field for beneficiating and treatment of iron ores is large, and promises a considerable addition to the possible iron ore reserves.

The writer fully appreciates the importance of a frank study of natural resources and the folly of wasteful use of them, especially such as are not reproduced. He also is satisfied that his record as an investigator of deposits of iron ore and his reports upon industries remove him from the class of optimists who expect every indication of ore to develop into a great mine, or that each locality where ore and fuel can be assembled advantageously will become an important prospective industrial centre.

The problem is to be studied from the standpoints of deposits now exploited, of those unwrought, but concerning which ideas of their extent and character have been formulated by exploratory work, and of those whose locations are made known by prospecting, with allowances for probable iron ore supplies suggested by geological conditions.

If the study of the iron ore reserves is undertaken in connection with present or possible fuel supplies, with consideration of prospective producing and consuming centres, the time when iron may be a "precious metal" or the available supply of iron ore becomes exhausted may be so far in the future as to allay any present anxiety.

The greatly augmented production of iron is undoubtedly making such heavy draughts upon the developed iron ore mines in the world as to awaken interest in the question of future supply, and unless there are additions to these one need not be pessimistic in anticipating a shortage.

On the other hand, when the probabilities of located but not developed ores are considered, when the possibilities of advanced metallurgy are studied, and when we realize how much of the earth's surface and geology is still unknown, or imperfectly known, one need not be an optimist to express confidence that an ample supply of ore will be found to meet the needs of mankind.

But he who formulates estimates of quantities from which to prophesy the end of the world, as far as iron ore is concerned, or he who multiplies these quantities by vague percentages, demonstrates how little reliable data is available concerning the iron ore reserves.

Recent Developments in Mining in the Southern Yukon

By D. D. Cairnes, B.Sc., M.E., Geological Survey, Ottawa.

(Toronto Meeting Canadian Mining Institute, 1907.)

By permission of the Director of the Geological Survey.

In introducing this subject, it may not be entirely amiss to mention some of the conditions under which mining operations must be conducted in this somewhat northerly portion of Canada. Until very recently the common idea of this district was that it was one of perpetual snow and ice, and one very difficult of access. Pictures and newspaper accounts of the Chilcoot Pass and the building of the W. P. & Y. Railway are mostly accountable for this opinion. Now a person can travel to Whitehorse or Dawson with the same comfort as to any of the ordinary popular summer resorts of the West.

Steamers ply regularly between Seattle and Vancouver and Skagway—distances respectively of about 1,000 and 867 miles. From here Whitehorse is reached by the W. P. & Y. Railway, a distance of 111 miles, thence steamers run to Dawson—460 miles.

The placers for which the Yukon is so well known occur chiefly in the northern portion of the territory—the richest being within a few miles of Dawson, on the creeks running into the Klondyke and Indian rivers. The only places where quartz mining has been done are just west of Whitehorse and along Windy Arm to the south, and it is with quartz and coal mining that this paper has to deal.

In actual mining there are few more difficulties to contend with than in British Columbia, or many other northerly parts of the world where mining is carried on extensively. At least six months are suitable for surface working and for the necessary outside operations, and during several months of this time work can be carried on by night as well, almost, as by day without artificial light; and, although the frost extends to considerable depths, in places, this does not interfere to any great extent, except on the very surface, while working in soil and loose material. The current wage paid to miners in the Windy Arm mines this last season was $3.50 per shift of eight hours, with board and lodging included.

With the exception of the Whitehorse copper district, little or no quartz mining, except a few assessments in scattered places by prospectors, had been done in the Yukon until the latter part of the season of 1905, when Col. J. H. Conrad commenced to develop some properties on the west side of Windy Arm. As a result of this the little town of Conrad has sprung into existence; a great many men have been employed; a

waggon road has been built from Cariboo Crossing along the beach to Conrad, about 11 miles; Government trails have been build up to the mines, connecting several of them; three ærial tramways have been built to carry supplies, etc., to the mines, and to carry ore down to the beach, and a foundation has been laid for what appears to be a permanent industry in the Yukon. Moreover, men have been encouraged to prospect further, with the results mentioned below. A new mining district was also formed this season, with a mining recorder's office at Conrad, called the Conrad Mining District, embracing the Windy Arm district and extending north to include the Watson and Wheaton rivers districts.

It is not the purpose of this paper to go into details in regard to the different properties of this district—a full account of which will be published in the writer's detailed report by the Geological Survey—but merely to give the general characteristics of the district.

Topographically, the country is very rugged, the summits rising as high as 5,200 feet above Windy Arm, or about 7,360 feet above sea level. No timber exists, except in some of the valleys and part way up some of the hillsides, ceasing, however, entirely at about 2,000 feet above the valleys. Most of the Windy Arm properties are situated high up on the bleak mountain sides, and all wood, timber, supplies, machinery, etc., had to be packed or pulled up by mules or horses. This is done now mostly altogether by the ærial tramways. So that prospecting and opening up the properties was both difficult and expensive. The district is, however, very accessible. The ore having arrived at the beach of Windy Arm, is loaded on boats and carried to the railway at Cariboo Crossing. There is also a good grade for a railway from Conrad along the beach to Cariboo Crossing; or a spur could be run from Log Cabin direct to Conrad.

The minerals in this locality are in quartz veins, in true fissures, and the values are chiefly gold and silver. The Big Thing veins are in granite; all the others are in a formation I have called the Windy Arm formation. This consists of a somewhat complex series of porphyrites, diorites, gabbros, etc., which apparently represent rocks from the same magma, but which differ considerably on account of segregation and cooling under different conditions. These rocks are generally fresh looking, fine-grained, and greenish in color. Towards the edge of the series, in places, is a porphyry presenting somewhat the appearance of a conglomerate, due to portions of one porphyry being included in another.

The veins vary considerably in width, but in most cases are noticeably persistent in length. Argentiferous galena is the common mineral of value. There are also found some native silver, argentite, stephanite, pyrargyrite, tetrahedrite, chalcopyrite, jamesonite, stibnite, lead carbonate, malachite, azurite, pyrite, arsenopyrite, pyrrhotite, and sphalerite.

The principal vein on the Big Thing group was struck this summer at the end of an 80 foot drift. A crosscut was then run 60 feet on the vein and a winze was sunk, which, when seen in October, was about 55 feet deep. The vein was widening rapidly and becoming almost flat, and was, in the bottom of the winze, about 10 feet wide. This vein appears to be of the elongated lense type. The ore is chiefly secondary quartz, and is very porous, near the surface, due to leaching action. The minerals are chiefly oxides and carbonates, which will give place to the sulphides in a short distance. Some stibnite, arsenopyrite and pyrite were found near the bottom. High assays, running into the hundreds have been obtained in gold and silver, and it is claimed the ore body will average close to thirty dollars per ton.

On the Montana, a drift was run in on the vein about 700 feet, the vein being from 2 to 5 feet in width, with a streak of rich ore 8 inches to 18 inches wide next the hanging wall, which assays about $90.00. The rest of the vein may run $20.00. An incline had also been sunk on the vein, which, at a depth of 320 feet, was about 8 feet in width, from wall to wall, with over 4 feet near the centre of almost barren, leached, and somewhat decomposed porphyry with quartz stringers running through it. The values are chiefly in silver, the chief mineral being galena.

When seen in October, the Vault, which had a drift run in on the vein over 300 feet, was probably the most promising looking property in the district. This is the same vein, in all probability, as the Venus No. 1, and can be traced over 4,000 feet. It is, in places, 20 to 30 feet in width, being nearly all well mineralized quartz. In places there are 4 to 6 feet of almost solid galena. The lead here, as on the Venus, varies greatly in width, and at times is only a foot or so wide. So far, however, the vein on the Vault has been much more uniform in width than on the Venus.

On the Venus, a crosscut tunnel was run about 100 feet to the vein, and drifts were run about the same distance each way, from which a number of stopes were raised, the vein being from 18 inches to 16 feet in width. In the stopes there are from 4 to 8 feet of good ore, which will probably average over $20.00 in gold and silver. A lower crosscut has also been run 544 feet to the vein, and drifts have been run each way; but where opened up here it is narrower and leaner than in the upper tunnel. This feature is likely only of limited extent, as the property looks well both to the north and south of this place on the surface. The chief minerals are galena, lead carbonate, arsenopyrite, chalcopyrite, malachite, pyrite, and also considerable jamesonite and antimony ochre. The ore is chiefly argentiferous galena. Where the vein is wide it consists of alternating bands of quartz and more or less mineralized country rock. A 50 horse-power gasoline engine operates a compressor here to run the machine drills used in tunnels, but piping and the necessary machinery is being installed to utilize some of the water power of Pooley Canon to replace the gasoline.

On the Humper No. 1, only about 70 feet of work had been done, when last seen, mostly in the form of drifts, but the property looked very promising indeed. The vein, which can be traced for 1,700 to 1,800 feet, at least, is from 18 inches to 4 feet in width, and carries considerable argentite, ruby silver, and stephanite, and also some native silver, galena, and pyrite. About 8 inches of the vein will average over 300 ounces in silver, and a narrow streak of argentite, one-half to three-quarters of an inch in width, which is quite persistent, runs 3,000 ounces in silver.

There are also several properties, such as the M. and M. and the Ruby Silver, on which are veins only a few inches in width, often less than a foot, but which contain very high grade ore.

In the above description of claims seen, no attempt has been made to describe all the promising looking properties or to give many details in regard to those mentioned. Only a somewhat general idea of the character of the deposits and their values has been attempted. The properties are all, as yet, in the prospect stage, and only small shipments of ore have been made from time to time; but what has been done shows this belt to be very highly mineralized at least. Reports of numerous discoveries came in at different times during the season from different directions, chiefly from along Taku Arm, and the ores shown looked very good indeed.

The success met with in this district encouraged men to prospect more than in previous seasons in this locality, with the result that a number of valuable discoveries were made. On June 21st, the Gold Reef claim, on which were discovered quartz carrying free gold and telluride minerals, was staked on Gold Hill about 16 or 17 miles southwest from Robinson, and in the next 90 days 700 claims were located on the same belt. This belt or belts of schists, approximately one-half mile wide, outcrops in a northwesterly and southeasterly direction near the eastern edge of the granites, which often become porphyritic. Dykes of greenish porphyry and porphyrite occur in the granites, also near their eastern edge, and it is in this disturbed belt that the quartz veins occur. They are often quite well mineralized, the chief

(To be Continued)

THE WORKS OF THE ROBB ENGINEERING COMPANY, AMHERST, N.S.

In the year 1865, Alexander Robb, the father of the president of the Robb Engineering Company, established a foundry and machine shop in Amherst, N.S. Stoves and general castings were made, and coal mining machinery was repaired. In 1890 the company was reorganized and incorporated under its present name, the sons of the founder being the chief officers. The following descriptive sketch of these modern works will give a fair idea of one of Nova Scotia's most important enterprises:

To the average man or woman there is a pleasure in watching moving machinery. This pleasure has been greatly enhanced for those who have the opportunity of visiting the modern steam or electric power stations, with their masses of bright machinery, producing thousands of horse-power with entire smoothness and little apparent effort, or a large machine shop of modern construction, consisting of a spider-like structure of steel, high roof and walls more than half glass, an industrial crystal palace, filled with curious machines for planing, drilling, turning and shaping steel and iron. The observer is first attracted by the overhead electric cranes operated by what appears to be a human fly perched in his little cage attached to the huge crane which is running back and forth at the beck and call of the workmen on the main floor of the shop, carrying parts of machinery weighing tons suspended in mid-air.

The cleanliness, light and order of the work form a great contrast to the old-fashioned machine shop, with its small windows, dirty floors and grimy workmen.

The works of the Robb Engineering Company, at Amherst, N.S., especially the new machine shop and electric power house, form one of the best examples of a modern industrial establishment, and arouse the interest of the visitor to an unusual degree. Visitors are always welcome, and to actually see the shops and operation thereof is much better than any description, but we will do our best to give some idea of their extent and system of operation, which will doubtless be interesting to many of our readers.

General Plan.

The works are situated on both sides of La Plance and Lawrence streets, the land having an extent of about 10 acres. Facilities for receiving and shipping material are provided by a system of standard gauge tracks leading through the yards into the machine shops, boiler shops and warehouses, and connected to the extensive station yard of the Intercolonial Railway at Amherst. Narrow gauge industrial railways, for the distribution of raw material and supplies, connect the various shops and warehouses with each other.

Power House.

The steam and electric power house of the company, which is situated between the engine department and foundry, practically in the centre of the works, is a model of perfection. It contains a 350 horse-power Robb-Armstrong Corliss engine, directly connected to a General Electric dynamo of corresponding size. From a large marble switchboard in this power house electric current is taken to all departments of the works which are driven by electric motors of the Bullock, Westinghouse and General Electric make. The switchboard is so arranged that either power or light may be supplied to any portion of the works, and is under control of the engineer. The power house also contains a smaller steam engine and dynamo, of the same description as the larger one, for use at night or for running a portion of the works only. Two Robb-Mumford boilers of 150 horse-power each are used to furnish steam.

The economy of this plant is very marked, as compared with the original steam plant having long steam pipes and engines located in various parts of the work, and leaves nothing to be desired in smooth running and freedom from repairs, as there have been practically no repairs or stoppages since the plant was started, about two years ago.

Adjoining the engine room is a large heating plant, which supplies warm air in winter by underground ducts to various parts of the works, the heat being obtained from the exhaust or waste steam.

New Engine Shop.

The latest and best of the buildings is the new machine shop, built in 1904, for manufacturing the Robb-Armstrong engines. It is a brick structure, of the latest slow-burning construction, 250 feet in length, 100 feet in width and about 50 feet in height. One side of the building, 50 feet by 250 feet, and the full height to the roof, is used for assembling, erecting and testing engines, and is served by a 25 ton electric crane, travelling the whole length of the shop. The other half of the building has an upper floor or gallery, the lower half or main floor being occupied by the heavy machines and the upper floor by the light machines and hand fitting benches. The machinery in this building is of the latest design and is especially adapted to the building of the Robb-Armstrong engines. Many of the machines have been especially built for this work and are capable of machining the parts of these engines from about 15 horse-power up to compound engines of over 2,000 horse-power. The system of work, which has been carried out from the beginning, when these engines were intro-



ENGINE DEPARTMENT, LOWER FLOOR—ROBB ENGINEERING COMPANY, AMHERST, N.S.

duced, is very perfect. Record drawings, duplicates of which are kept in the vault of the company, as well as in the drafting office when finished is numbered to correspond with the drawing and patterns, so that customers can readily obtain duplicate pieces by sending in the number of the engine or part required. The machine and work shops, show every piece of each engine in detail from which the patterns are numbered, and every part of each engine work is all on the interchangeable plan, the parts being made to standard gauges, all turned work being carefully ground and flat surfaces scraped to standard sizes and perfect surface. A large quantity of spare parts are constantly kept in stock for use in assembling engines as the orders come in and to supply the orders of customers for duplicate parts. The workmen having nearly all entered the works as apprentices, have been trained in this special system, so that the organization may be compared to a perfect machine, all its parts working in harmony. A premium system is in use in this portion of the works, and is giving good results. The details of work to be done on each portion of every engine is carefully described and specified to correspond with the drawing, and a set time is apportioned to do each part of the work. If the workman is able to do the work in less time than is specified he is entitled to receive a premium amounting to one-half his regular rate of wages for the amount of time saved. Every piece as it is finished is carefully measured and inspected before being stamped and placed in stock.

BOILER SHOP.

The boiler shop is the next largest department to the engine shop, and is about 100 feet wide x 200 feet long, with several wings. It is also of modern construction, fitted with electric cranes, a complete plant for hydraulic riveting, capable of driving rivets up to 100 tons pressure on each rivet. An air compressor plant, with compressed air pipes to all parts of the boiler shop and other departments of the works is used for pneumatic caulking, drilling, tapping, bending tubes, and almost all the operations of boiler-making and machine work which were formerly done by hand. The shops are also fully equipped with machines for drilling and reaming the rivet holes of boilers, the best modern boiler specifications requiring double butt straps and rivet holes drilled in place, so that there is no danger of imperfect holes and no necessity for drifting and distorting rivet holes, as is found necessary when they are punched without reaming.

This company does a large amount of boiler work under Government inspection, as well as under the local inspectors of British Columbia, Quebec and other Provinces where rigid inspection laws are carried out.

GENERAL MACHINE SHOP.

In addition to the large machine shope, which is used exclusively for engine work, the company have a general machine shop, which its about 55 feet x 200 feet. In this shop special machine work, such as piping, shafting and general machine repairs is done; and also a line of portable sawmill machinery, which is used extensively in the Maritime Provinces and British Columbia is manufactured. The details of the work are carried out on the same general system as in the other departments of the works.



ENGINE DEPARTMENT, UPPER FLOOR—ROBB ENGINEERING COMPANY, AMHERST, N.S.

FOUNDRY.

The foundry, which is in the centre of the works, and connected to the engine building shop and boiler shop by the industrial railway, is equipped and operated on the latest system, having electric cranes, pneumatic lifts and other appliances for handling heavy materials and melted iron quickly and cheaply. The company makes all its own iron and brass castings, in fact everything is manufactured on the premises from the raw material except special fittings, as oil cups and light trimmings required for engines and boilers.

FORGE.

The company has its own forge, which produces machine forgings of all descriptions necessary to engine work, boiler work and the other lines manufactured by the company.

PATTERN SHOP.

The pattern shop is another department well worth a visit, as it is under the direct control of the drafting department, every pattern being made to follow the system of drawings used throughout the works and with numbers corresponding to such drawings. As the patterns are used over and over, they require the greatest strength, lightness and accuracy of dimension that it is possible to get. Some of them are marvels in these respects, when it is considered that they are all made of soft pine, except such small and special patterns as are afterwards reproduced in iron or brass.

STORES SYSTEM.

The stores system of the company has been developed on modern lines, and is arranged so that all the material, parts of the engines and other machines are stored in the warehouse of the company, under control of a general store-keeper, who has a force of helpers to deliver materials or supplies, as called for by requisitions, to all parts of the works. A complete inventory of all the raw materials and work in progress is kept by a card index system, giving a perpetual inventory of these materials, as well as their cost. The system also includes a cost-keeping department, which enables the company to obtain readily the cost of all materials, either in a raw or finished state, and of complete contracts.

The products of the Robb Engineering Company have a world-wide reputation, the company having the distinction of supplying Canadian engines for Great Britain, Spain, Australia, West Indies, British Guiana, Austria, and India, as well as in all parts of the Dominion, from the Atlantic to the Pacific. We noticed among the list of orders shown us under construction engines and boilers for mines, factories, electric light installations and lumber mills in every Province of the Dominion, including the following prominent cities and towns: Sydney, Cape Breton; Halifax, N.S.; St. John, N.B.; Montreal, Quebec; Ottawa, Toronto and Hamilton, Ont.; Winnipeg, Manitoba; Saskatoon, Sask.; Calgary, Blairmore and Bankhead, Alta.; Golden, Kitchener and Vancouver, B.C.

CORRESPONDENCE

[THE CANADIAN MINING JOURNAL, while it welcomes letters on current topics, is not responsible for opinions expressed by correspondents.]

To the Editor of THE CANADIAN MINING JOURNAL:

There are some further arguments in support of the magmatic origin of the hot waters discharged by hot springs, geysers and volcanoes, which I will add here.

The silica, lime and other mineral salts carried in solution in those hot waters would be deposited along the path of ascent and completely fill all pores in the rock by cementation, thereby preventing the access of any surface waters. The deposit of geyserite at the surface in the shape of a small crater surrounding the discharge from such springs, is evidence that there is a surplus of such material carried in solution. These solutions would penetrate the walls of the crater or fissure along which they rise, and when encountering rocks cold enough to cause precipitation would part with a portion of their salts, thereby completely isolating their path from all connection with meteoric waters.

The process of cementation would begin at the point of rock flowage at a depth of thirty-five to forty thousand feet and rise gradually to the surface; the crater of geyserite at the surface being the final evidence that the path is isolated from surface waters.

The cementation of such a channel, fracture or crater, would act in the same manner as the casing of an oil well. It would completely shut out the surface waters, and only differ from the casing in being composed of crystallized rock filling built up from the bottom, instead of an iron pipe driven down from the surface.

At several places in Yellowstone Park it is possible to catch trout from the lake, and, without detaching them from the hook, to dip them in a boiling spring. This fish story will illustrate how completely isolated the path of the hot water or steam is from the cold water inhabited by the fish. Many geologists assume

that the hot waters discharged by such springs and geysers are surface waters, which penetrate into the earth until they come in contact with intrusive hot rocks, and are thereby heated and discharged at the surface. They are willing to admit the absurdity of this argument when applied to the waters discharged by volcanoes, but they hesitate to take the necessary plunge and cut loose from the only source of water supply that they know anything about. The difference between a hot spring and a volcano is only a difference in volume and temperature. One discharges a small amount of hot water with mineral salts in solution, the other throws out millions of tons of atomized or fluid lava, together with a great quantity of incandescent steam or streams of boiling mud.

To illustrate the action of surface waters being heated by coming in contact with hot intrusive rocks, I will refer again to the cementing action of the mineral-laden solutions. If such waters were heated in the manner referred to, the cementation of th adjacent rocks would quickly form an impervious shield about the source of heat and completely shut off all circulation. It is, therefore, only possible to account for a constant discharge of hot water through a long period of time by assuming that the supply is of magmatic origin.

In the paper on "Magmatic Waters" it was pointed out that if the central magma contained only 0.1 per cent. of water by volume, that this would show that there was still more water in the interior of the earth than there is on the surface. An average of 15 known volcanic gases, according to Kemp, shows 1.66 per cent. of water. An average of 14 rhyolites gave 1.16 per cent. water. An average of 13 granites, 0.55 per cent water. It would appear from these analyses that there is several times as much water in the interior magma as there is on the surface of the earth. The opening through which communication is kept up with the interior magma would necessarily be small, and the pressure and temperature of the water gas would finally pass beyond the critical point, where it would be a permanent gas.

According to Chamberlin, Vol. I., page 218, the critical temperature of water is between 610 degrees and 635 degrees Fahr., and, with an initial temperature of 80 degrees and an increase of 1 degree for each 70 feet of depth, this condition of water would be reached at about 39,000 feet. Wherever along the thread-like pipes of hot springs or volcanoes the temperature and pressure pass beyond the critical point of water, the rocks must be in a state of potential fusion, and it only requires that sufficient openings occur for their rapid liberation to cause volcanic action.

The frequent elevation of the sea bottom in the shape of volcanic islands, which later sink from sight, is an illustration of the escape of such hydrous fusions to the surface.

Yours truly,

HIRAM W. HIXON.

Victoria Mines, March 25, 1907.

The Editor CANADIAN MINING JOURNAL:

Dear Sir,—I notice an editorial in your issue of April 1st in reference to Larder Lake and the difficulty of guaging the commercial value of the prospects in any way from a hand sample.

It may, therefore, be of interest to you to know that we have made arrangements to keep our laboratories open for the entire year, particularly with a view to testing ton and car load lots of such ores by amalgamation, concentration, cyaniding, etc.

This will not doubt be of considerable value in determining the treatment process necessary, but in connection with such free milling ore as the Larder Lake, it will be of greatest use in determining the average of a large tonnage of ore and making an actual bullion return.

Yours truly,

S. F. KIRKPATRICK.

Professor of Metallurgy, School of Mining, Kingston.

School of Mining, Kingston,
April 8th, 1907.

Editor CANADIAN MINING JOURNAL, Toronto:

Dear Sir,—The following may be of some interest to you. The writer had submitted to him a sample of rock, supposed to be talc of soapstone. In appearance, feel, cut, etc., it gave every evidence of being talc. More for the satisfaction of getting its exact composition, than because of any suspicion that it was not what it appeared to be, analysis was made of it. To the writer's surprise, instead of magnesia, alumina was found.

The complete analysis was: Silica, 65.60 per cent; alumina, 28.80 per cent.; ferric oxide, practically absent; lime, practically absent; magnesia, practically absent; water (by difference) 5.60 per cent.; total, 100.00 per cent.

The sample was then tested with cobalt nitrate, which gave a good blue color. So that, instead of talc, it proved to be pyrophyllite. Whether it would serve the same purpose as talc is a question. As far as the use of talc in lining furnaces, etc., is concerned, the pyrophyllite should be better, as being a silicate of alumina one would expect it to be more refractory. Possibly you or your readers can, through previous experience, throw some further light on the subject.

Yours truly,

NORMAN HOLLAND,
Superintendent McCaskill, Dougall & Co.,
Varnish Manufacturers, Montreal.

In the tantalum lamp, a very fine tantalum wire is used instead of a carbon filament. The tantalum wire has a length of two feet, and but half the current is needed to produce a light of the same intensity as that of the ordinary incandescent lamp with a carbon filament. The light is so much brighter, and the life of the lamp is so much larger, that a saving would be effected in paying one dollar for a tantalum lamp, even if one could get the carbon lamp for nothing.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

The prospects for continued peace of the Springhill collieries is rendered doubtful by the action of the union men in trying to force the non-union men into the society known as the Provincial Workmen Assocciation, or out of the town. As the non-union workmen form a small, a very small, minority, trouble will in all probability result. The management maintain a strict neutrality. It is to be hoped, for the welfare of all concerned, that the works will not be interfered with. It is difficult to understand the union men's contentions. It is well known that when a strike is declared in Springhill, very few "scabs" are in evidence. A few driver boys have even been known to stampede the whole working force. When men are so subservient to union rules it seems obsurd to dub them non-union men, even if they have not joined the society. There would appear here little left to differ about.

The collieries at Springhill are in full operation again. The uneasiness caused by a small section of gob heating in No. 3 mine has completely died out. The prompt action taken in "shutting off" the affected district and thorough ventilation of the recovered sections, all tended to inspire confidence in the perfect safety of the mine. The number of workmen at work in this mine at this date is slightly in excess of the number employed at the time of the "scare." The thickness in this seam, "the overlying seam of the series," varies from 4 feet 6 inches to 11

feet 6 inches.'' The coal is of good quality and easily worked. The system adopted in working is ''board'' and pillar. The depth of stope is 4,500 feet, with a grade of 30 degree average.

GLACE BAY.

Glace Bay, 30th March.—The Provincial Workmen's Association is at present pursuing a very aggressive policy in the colliery lodges around Glace Bay, but the recent endeavors to augment the membership has not been marked by the cautious wisdom which has for some time past been a distinguishing feature of the P. W. A. propaganda.

The lodges have adopted the plan of naming a day by which all men employed at any one mine must join the P. W. A., giving notice that otherwise they will close down the mine and refuse to work with non-union men. Following the success of this method at the No. 3 mine of the Nova Scotia Steel & Coal Company, at Sydney Mines, notice was given at Dominion No. 1 that after the 19th of March the P. W. A. men would refuse to work with non-union men. After a two days' stoppage of the mine, practically every man came into the union, and the men signified their readiness to return to work. The Dominion Coal Company had previously given warning that they could not countenance the closing down of their mine in this way, and that if this step was taken the mine would be closed for repairs. This was done, and No. 1 is now undergoing a much-needed overhaul, having been running without interruption since operations commenced after the fire.

The attitude of the Coal Company in this matter has been clearly defined by the management, and appears to be a perfectly proper and natural one. They gladly recognize the utility of the P. W. A. as a means of dealing with their men as a body, and as a channel for the proper representation of grievances, but they cannot allow the ''closed shop'' in their mines, nor any policy that would interfere with the independence and individual rights of their workmen. The action of the Dominion Lodge was further a direct violation of the terms of the ''Three Years Contract'' which has hitherto been loyally observed by both the men and the Company. Judging from the ease with which the non-union men were induced to enter the P. W. A. it is evident that judicial moral suasion would in all likelihood have achieved the same end, and it appears to be generally recognized that the action of the Dominion Lodge was somewhat hasty and ill-considered.

The output of the Dominion Coal Company's collieries for March this year was lower than it has been for the past five years, the weather delays having been of a quite exceptional nature. During the larger portion of the month snowstorms followed snowstorm, all of them accompanied by high winds and heavy drifts, and traffic was more or less interrupted during the whole month. The blizzard of the 7th March is said to have been unprecented in the meteorogical annals of Cape Breton.

QUEBEC.

The asbestos properties of the Glasgow & Montreal Asbestos Company and the Manhattan Asbestos Company, in Black Lake, were recently sold to Mr. H. M. Whitney, of Boston. These properties, which adjoin, are considered valuable asbestos-bearing territory, but the lots were too narrow to admit of their being operated advantageously as individual properties. As a result of the present consolidation, both properties will be operated from one central machinery plant, while the number of pits will be limited, perhaps, to one or two. As space for dumping ground on the property of the Manhattan Company is limited, it is equipped with a tramway 3,000 feet long, over which all the waste rock will be carried to Cariboo Lake. The new company is meanwhile replacing the old plant on the properties with new equipment for mining and separation. Mr. H. M. Whitney also owns the King Bros. mine in Thetford, the largest asbestos producing property in Canada, and the American Asbestos Company, in Black Lake. The Standard Asbestos Company, operating at Black Lake, has disposed of about 300 acres of its asbestos land to an American syndicate, and a 100 ton separation plant will be erected shortly on the premises.

The Bell Asbestos Company, of Thetford, formerly controlled by British capital, was recently taken over by Americans, the property having been acquired by a manufacturing firm at Andles, Pa.

Mr. Martin, of New York, a well-known operator of asbestos mines, exercised the option which he held on an asbestos property in Tingwick. After a thorough test, by means of pits, a small asbestos refining plant was also installed at the property.

By recent changes in the ownership of a number of the largest mines in the asbestos region, the asbestos industry is now largely controlled by Americans, who own the more productive properties. There will shortly be in operation fourteen properties, of which one-half are American owned, six being held by Canadians and one under British control.

COBALT—THE FOSTER MINE.

Cobalt, Ont., April 10.—The mine is located on the southeast part of the north half of lot 4, concession 4, Coleman township, and consists approximately of twenty acres land and twenty acres water. The water takes in the middle of Glen Lake and the northwest corner post is on the north shore of the lake.



COBALT LAKE
Showing new buildings, Cobalt Lake Mining Company

The land lying on the south shore of the lake consists of a knoll of conglomerate, overlying the Keewatin series, the contact dipping northwest. There are diabase and Huronian and Keewatin contacts approximately parallel to the shore of the lake.

Eight veins have been exposed by stripping.

No. 1, on the lake edge, yielded several cars of high grade ore in 1905, strike northwest, and was worked by an open cut seventy feet long and thirty feet deep; vein four inches wide.

No. 2. In the Huronian. Strikes northeast. Vein from two to six inches wide. Two shafts have been sunk 120 feet apart, and 73 feet and 78 feet deep. Connecting drift is at 47 foot level, 180 feet long, and the ore has been partially stoped above this drift and also underhand along a Keewatin contact. Shafts 5 x 5 and 6 x 9, round timbers and cribbing.

No. 3. Strike a little west of north, close to Lawson boundary, and worked by an open cut 60 feet long and 30 feet deep.

No. 4. Northeast strike. Small shaft, 25 feet deep, vein one inch to two inches wide.

No. 5. Large, well-defined silver and cobalt vein, northwest strike. In places, 14 inches wide on the surface. Shaft at west end of vein sinks 72 feet, and drifts northwest and southeast are being driven at 70 feet. Present lengths of drifts, 60 and 20 feet, respectively. Shaft is 8 feet x 4 feet 6 inches in the clear, and is timbered with square sets and will be used as the main hauling road. A cage is on the ground and will be used on arrival of a large hoist, now on order. Thirty foot gallows frame is erected, and shaft house is being completed.

No. 6 shaft, 5 x 8 feet, 78 feet deep, round timbered and cribbed; 20 foot gallows frame and shaft house completed, 5 x 6 hoist, operated by air, installed in small engine house. Strike, northeast; vein, two to five inches wide. Drifts at 65 feet. Northeast drift, 80 feet long; southwest drift, 127 feet, cut No. 5 vein at 123 feet. Drift northwest on vein No. 5(east end) is now in (30 feet). A small stope is being raised on southwest drift, No. 6.

Nos. 7 and 8, northeast veins, parallel and close together, about one inch wide each, showing bloom and silver.

The equipment consists of an eight drill air compressor, built by Allis-Chalmers-Bullock Company; two 60 horse-power Ames boilers; Knowles feed water heater; Knowles supply pump, delivering into 5,000 gallon tank at an elevation of thirty feet above engine room floor; Knowles duplex feed pump; four k.w. direct



COLONIAL MINING COMPAN

acting Allis-Chalmers-Bullock engine and dynamo; one 8 1-3 x 10 hoist; two 5 x 6 hoists; three air receivers; eight 3 inch air drills; one 2 1-4 inch air drill.

The buildings consist of No. 5 shaft house, No. 6 shaft house, cobbing house and ore shed, smithy; power house, 50 x 30 feet; power house, 10 x 12; thaw house; store house, 20 x 24; barn; office building and manager's house, 24 x 30; dining camp, 80 x 24, ice house and three sleep camps. Mine houses are all sheathed with galvanized iron. Office and dining camp are boarded, painted and shingled. The buildings are supplied with water works and steam heated. One hundred feet of fire hose and five hand extinguishers, to provide against risk of fire.

Two thousand cords of wood have been cut and stacked, and no difficulty is expected with fuel this year.

The Temiskaming & Northern Ontario Kerr Lake branch has been started, and should be through by the fall. It crosses the property at the southeast corner.

Montreal River.

Considerable interest is being taken in the recent discoveries of silver and cobalt in the Montreal River district. The area at present being prospected is to the north of Lady Evelyn Lake, on both sides of the Montreal River, and as far north as Smythe township, and including the townships of James, Tudhope, Barber, Auld and Smythe. The area to the west is in the Temagami Forest Reserve, and it is necessary to have a special permit to carry on prospecting and mining.

The Montreal River is a navigable stream for small steamers from Latchford to Pork Rapids, or a distance of eight miles, where there is a short portage; then to Mountain Lake by another steamer line. Thirty miles from this point the river opens out into a series of long lakes, one, Elk Lake, is now attracting a lot of attention, owing to the silver finds made in James township.

At the time of the writer's visit there was two feet of snow on the ground, and it was only in the higher parts or ridges that the formation could be observed. Alternate low ridges of granite and diabase outcrop, with a general course of northwest and southeast, or nearly parallel to the Montreal River. It is in the diabase that the silver occurs. Several claims in widely separate parts of James township and Smythe, show calcite veins, in which native silver and cobalt bloom are found. Silver was also seen to the west of James township, and on Maple Mountain, to the north of Lady Evelyn Lake.

Very little can be said about the future of the district yet, except that native silver and cobalt has been found over a large area; the country rock is diabase, the formation in which some of Cobalt's richest mines occur; that the fissuring is extensive, and for the amount of development work done the prospects are encouraging for a permanent silver camp.

A recorder's office is to be established in Latchford for the Temagami Reserve. This will be a great convenience, as extensive prospecting will be done on the Reserve. Already the great influx is showing the faith of the community in this most interesting field.

Latchford once more is experiencing its annual boom, and building lots have again advanced to fabulous prices. Its last year's experience, and also that of Cobalt, should be a lesson showing the distastrous effects of such a policy.

The rich silver strike on the Temiskaming and Hudson Bay property, adjoining Sasaginaga Lake, has been one of the sensations of the week.

Cape Breton.

Some prospecting work is being carried on in the iron areas known as Father McPherson's areas, situated on the top of the Boisdale Hills, in the Island of Cape Breton.

This property has been well known for a number of years, but very little work has been done towards testing it. It is situated geologically in the Precambrian, and the ore is associated with George's River limestones and felsites.

This work is now being carried on by Mr. W. F.Jennison, who controls the property, and the showing thus far is very encouraging. Ore was struck very close to the surface, and crosscut to a width of 20 feet. A shaft was put down on it 30 feet deep, and found the same width of ore. The sinking of this shaft is being continued.

Shipments are being made to the Nova Scotia Steel Company. This is practically the first development of low phosphorous ore that has been discovered here. Phosphorous runs as low as .006 and iron as high as 58.42. It carries sufficient lime and magnesia to flux the silica. The situation has an elevation of 650 feet above the sea level, and is only half a mile from the Bras D'Or Lakes. Its position is ideal, either for railroad or water shipments, and is only 21 miles from the plant of the Dominion Iron & Steel Company, Sydney.

Mr. Jennison is now putting in steam pumps, hoists and drills. This, with an ærial tramway to railway, will make a complete equipment by which he can handle the ore at a very reasonable cost. We are looking forward for this property to develop into an important mineral industry of the island.

MINING NEWS

After hot debate, the Western Coal Operators' Association and the Union Mine Workers of America succeeded in reaching an agreement at their conference in Calgary. The net result is that miners will receive a 5 per cent. increase in the outside wage scale. The agreement stands for one year.

Dr. G. A. Young, of the Geological Survey, will probably be sent to Nova Scotia this summer to investigate thoroughly the occurrence of tin throughout the Province.

The Great Bras D'Or Gold Mining Company, of Middle River, C.B., are tunneling actively on their property. Placer gold, found in small amounts in neighboring streams, led to the exploitation of this area.

Twenty-one cars of zinc and silver lead ores were shipped from Whitewater mines, Kaslo.

On March 21st the eight-hour smelter bill passed its second reading, and was reported in committee on March 22nd.

An Act to incorporate the Cariboo & Pacific Mining, Smelting & Development Company is sought from the Provincial Government by Messrs. Edgar Bloomfield, R. G. Spinks and G. C. Van Horne, of Vancouver. The capitalization of the company is to be $1,000,000, in ten thousand shares of $100 each.

The Hamilton Iron & Steel Company are providing for additions to their present plant, involving an outlay of $350,000. The capacity of the blast furnase will be increased, and the steel mill enlarged.

A 40-drill air compressor, ordered by the Dominion Copper Company, is soon to be installed. It will have a delivery of 937 cubic feet per minute.

The new hoist at the Centre Star mine, Rossland, is the largest of its kind in Canada. It is designed to hoist ten tons from a depth of 2,000 feet.

The entire output of La Roi mines, some of which has hitherto been shipped to Trail, B.C., will now be sent to the Northport smelter.

Yukon, March 16th.—Acting Commissioner J. T. Lithgow, on his recent return from the Twenty Mile country, reported great activity there on the part of the Consolidated Company. Wafer power plants are being installed, flumes constructed and roads and telegraph lines constructed.

The Klondike Mines Railway is hauling 200,000 feet of lumber from North Dawson to the Guggenheim Consolidated dam, above Discovery or Bonanza.

Material for a large dredge, which is to operate in Walker's Fork, has been assembled in Dawson. Mr. W. J. Hunter is superintending the freighting, and will be in charge during the coming season. The dredge has a five-foot bucket and a capacity of 2,000 cubic yards per diem. It will be ready for work about June 1st.

Fort William is now supplied with power from the Kakabeka Falls on the Kaministiquia River, 25 miles west of Fort William. The power is electrically transmitted by two lines. The generating and distributing machinery was manufactured and installed by the Canadian General Electric Company.

At Fort William and Port Arthur a large number of industrial plants are under construction, or are being projected. Among these are the Atikokan Iron Company, the Canadian Northern Coal & Ore Dock Company, the Canadian Iron Foundry Company, and the Northern Steel Company of Collingwood. The last named company are negotiating for the erection of a plant for manufacturing wire and nails.

The Laurentian Mine, Manitou, has been equipped with a new pump of 500 gallons per minute capacity. The 20-stamp mill will run double shift in future.

Kenora, April 3rd.—The Mikado Gold Mine is being unwatered for examination. It is under option to Mr. R. H. Ahn.

Many complaints are heard of wholesale blanketing in the Montreal River district. A prospecting license allows its holder to stake three claims, and no more. Licenses are, however, pooled; and men are despatched to the field holding ten, twenty, or even thirty licenses. Hence the fly in the ointment.

The Dominion copper smelter, near Greenwood, is being remodelled and renewed. An electrical blower is to be part of the eqiupment. The reorganized plant, it is expected, will be capable of smelting about 1,400 tons of low grade copper ore daily.

A company, under the title of the Vancouver Copper Company, Limited, is being organized to re-open the Lenora Mine at Mount Sicker. The consulting engineer is Mr. Cecil M. Bryant, A.R.M.S.

The Provincial Workingmen's Association has been carrying out its policy of forcing non-union men to join its ranks. Serious delays have been caused within the past year at Westville, Springhill, Sydney Mines and Glace Bay. At these collieries the union men stopped work until the non-union men had either joined the association or left the country. Dominion No. 1 colliery is idle now on this account, and further complications are threatened. The company stands for "open shop," and to this the men are strongly opposed. One significant fact is that the new labor law defines a strike as "ceasing to work."

The sixth annual meeting of the Nova Scotia Steel & Coal Company was held in New Glasgow on March 27th. Mr. Cantley's report for 1906 was very interesting, showing increases in all branches. It also showed that the plant of the company was in a high state of efficiency, and development work at their mines well up to the standard. President Harris went fully into the financial standing and future policy of the company, and stated that the management was exploring their submarine area at Wabana, and favorable results were anticipated, as they expected soon to strike the ore in paying quantities. He also stated that there was sufficient ore in sight at Wabana mines to supply the blast furnaces at Sydney Mines for twenty-five years.

MEN AND MATTERS

The late Commissioner of the Yukon Territory, Mr. W. W. B. McInnes, has been engaged by the Guggenheims to look after their interests in the Yukon.

The Dominion Coal Company have appointed Mr. Angus W. Macdonald as employment agent, thereby creating a new office, which has become necessary, owing to the large increase in the number of employees consequent on the increased coal production. Mr. Macdonald has filled a similar post with the Dominion Iron & Steel Company for the past six years.

We are glad to learn that Mr. A. P. Low, the Director of the Geological Survey, has so far recovered from the effects of his recent severe illness that he is now able to travel. Mr. Low left Ottawa on a visit to the South on the 4th of April. He is expected to return towards the end of the month.

Mr. John Knox, formerly in charge of mines at Camborne, B.C., was recently appointed underground mining superintendent for the Calumet and Hecla.

Mr. J. D. Kendall, well-known to many of our readers in British Columbia as for many years the resident partner in Vancouver of Bewicke, Moreing & Company, returned to England from a visit of inspection to the Cobar mines, New South Wales, Australia, of which he is a director and consulting engineer.

The election recently of our foremost geologist, Dr. Frank D. Adams, of Montreal, to fellowship of the Royal Society is a well-earned tribute to and recognition of the eminent attainments of a Canadian scientist, of whom the Dominion has right cause to be proud. In congratulating Dr. Adams, we congratulate ourselves.

Mr. Thomas H. Drummond, late general manager of the Dominion Copper Company, B.C., has been engaged by the Nipissing Mines Company, Cobalt.

Mr. H. Harris, formerly superintendent of the Hall Mining & Smelting Company's plant, has accepted a similar position at the Brown-Alaska smelter at Prince of Wales Island, under General Manager Thomas Kiddie.

Mr. J. H. Plummer, president of the Dominion Steel Company, went to England late in March.

An exhibition, or, rather, exposition of ores, machinery, mining methods and of every phase of mining operations, will be held at the Grand Central Palace, Lexington avenue, 43rd and 44th streets, New York, from April 15th to April 17th, inclusive. The exposition is under the auspices of the North American Mines Exhibition Company. Mr. Harold P. Davis, who has been arousing local interest in the exhibition, is collecting a large number of Cobalt specimens. Mr. Davis informs THE JOURNAL that show tables will be provided for ores from Northern Ontario. Indeed, specimens from any part of Canada will be welcomed.

Dr. J. Bonsall Porter is about to start west with a party of mining students. His itinerary will include visits to Cobalt, Lethbridge, Frank, Coleman, Coal Creek, Moyie, Nelson, Rossland, Trail, Grand Forks, Phœnix and Greenwood, probably with special excursions afterwards to Sandon and Vancouver. The party will work for about a week in field geology, under the direction

of Dr. Adams, and will then visit mines as above outlined under the direction of Dr. Porter and Mr. J. W. Bell. This excursion is the regular spring session of the mining students in McGill University. A series of such trips has been made in the last ten years. The West has been visited several times, Michigan once, Eastern Pennsylvania and Northern New Jersey twice, Nova Scotia twice, Newfoundland once, and Sudbury and vicinity once.

The appointment of Mr. John W. Bell, M.Sc., as Assistant Professor in Mining Engineering, McGill University, has been announced. Mr. Bell succeeds Mr. John F. Robertson, who has been connected with the University for some years, but who is now resigning to enter engineering practice in British Columbia. Mr. Bell is an old graduate of McGill, and was a member of the staff some years ago, but for the last seven or eight years he has been practising in British Columbia, the Western States and Mexico.

The recent fire has not damaged the McGill Mining Department. The loss in the Departments of Electrical and Civil Engineering is very great, and, in Mechanical Engineering, is considerable. The main engineering laboratories are, however, merely damaged, and by next September they will be in complete working order again. It will take longer to rebuild class rooms, etc., but the authorities expect to make temporary arrangements which will enable them to give full courses next year in all subjects.

Under protest THE JOURNAL publishes the following alleged poem. It is sincerely hoped that the Muse responsible for such an effusion will see the error of her ways:—

The Cobalt and the Silver flies,
The Minerals and the Men depart;
Still stands the Ready Sacrifice,
The Victim of the Fakir's art.
Single or married, young or old,
The Fakir parts him from his gold.

With Stocks and Things the Victim fools;
With Paper and with Promises;
And not a whit his Ardour cools,
He scorns the Doubting Thomases.
But ever what he thought he'd get—
He hasn't yet! He hasn't yet!

Far flung the Dollars disappear;
But still remains the trouble which
Makes ev'ry Fakir's progress clear;
That trouble is the Cobalt Itch.
Fakirs and Itch and Fools, you bet,
We have them yet! We have them yet!

Along with Canada's industrial awakening another manifestation of activity is observable. The poet is rehabilitating himself. No excuses are offered for reproducing these verses, for the simple reason that no adequate excuse can be found:—

My way lies ever far and far,
Beyond the dim horizon;
By day the blaze, by night the star:
I hate a town like pizen.

O'er mountain, gully, barren, swale,
Till worn, and wet, and weary,
I pitch my tent in moonlight pale,
And sleep, and don't feel skeery.

The sun is scarcely risen, when
I rub my eyes and waken;
My meal is as the meal of ten,
'Tis mostly beans and bacon.

As through the day my ringing pick
Makes music on the boulders,
I always hit an extra lick
And straighten up my shoulders,

From thinking of the dusty streets;
Of pavements hot and dirty;
Of people missing all these sweets;
The whole thing makes me shirty.

But when the trail is extra bad,
When hot and spent I stagger;
I must confess I'd swap my wad
For one long pint of lager.

EXCHANGES

The Mining World, March 30th, contains an article on the "Qualifications of the Engineer," by John Hays Hammond.

The Mining Investor, April 1st, is the annual statistical number. It contains many figures of production, etc.

The Maritime Mining Record for March 27th gives an unusually breezy and readable summary of coal mining matters in Nova Scotia.

In The Engineering and Mining Journal, March 30th, the geology of the Ely Trough iron ore deposits is described.

An article on "Rare Metals and Minerals and Their Uses," and a sketch of Cobalt by Mr. John E. Hardman, of Montreal, are outstanding features of The Engineering Magazine for April.

The Coal Trade Journal, April 3rd, in ar editorial entitled "The State of Trade," gives a cheerful prevision of the coming season's coal trade.

The Mining and Scientific Press, March 23rd, contains the second instalment of a very valuable series of papers on "How the Miner's Dynamite is Made."

A description of "Electric Furnaces Without Electrodes" marks The Mining Reporter for March 28th.

The Iron and Coal Trades Review, March 22nd, in discussing the pig iron market, deprecates the pessimisitic tone of a newspaper correspondents and describes the outlook as, at least, cheerful.

"Mining Anthracite by Longwall" is the leading paper in Mines and Minerals for April.

The Bi-Monthly Bulletin of the American Institute of Mining Engineers, among other good technical articles, contains one on "An Early Instance of Blowing-in Without 'Scaffolding-Down.'"

The March-April number of Economic Geology is of more than ordinary importance. "The Relation of Ore Deposition to Physical Conditions," by Waldemar Lindgren is an able exposition.

The Industrial Advocate for March urges the question of greater publicity upon the Nova Scotian public.

Fuel, for March 26th, and The Science and Art of Mining for March 23rd, have been received.

STATISTICS AND RETURNS

The week ending March 23rd saw the following shipments of ore in Southeastern British Columbia districts:—Rossland, 7,403 tons; Boundary, 24,933 tons; east of Columbia River, 2,714 tons.

Nipissing Mines Company.—The financial statement for the eleven months end March 30, 1907, disclosed the following information:—Estimated number of tons produced for 11 months: First-class ore, 11,000 tons; second-class ore, 1,300; cobalt ore, 32 tons. Amount received from sales, including ore on hand, $1,008,000; inventory May 1, 1906, $624,000; total, $1,632,000. Cost of production and all other expenditure, $176,000; net, $1,456,000. Dividends, etc., $800,000; surplus, $656,000. The surplus is made up of the following items: Cash and ore en route and at smelters, $546,000; accounts receivable, $28,000; mining equipment, $82,000; total, $656,000.

Dominion Coal Company.—Output for March, 1907, 210,890 tons; shipments, 153,000 tons, as against an output of 297,958 tons and shipments of 173,000 tons for March, 1906.

Cumberland Railway & Coal Company.—Shipments for the month of March were 27,982 tons.

CANADIAN PATENTS

March 26—104256—B. F. Henry, San Pedro, Cal., and G. W. Drake, Los Angeles, Cal., hoists.

104260—W. S. Gemmer and E. J. Schleecher, St. Louis, Mo., ærial tramways.

104268—A. L. Haines, Ft. Fairfield, Me., conveyors.

104285—W. A. Merralls, San Francisco, processes of cyaniding and apparatus therefor.

104286—W. B. Moore, Seattle, magnetic separators.

104289—W. H. Broughsedge, Ottawa, Ont., gold washing screens.

104289—J. F. Sauerman, Russellville, Ark., ore and coal crushing machine.

104365—W. H. Heard, London, Ont., safety clutches for power driven pumps.

104369—E. P. Mathewson, Anaconda, Mont., blast furnaces.

PUBLICATIONS

In writing for any of the following publications, readers are requested to mention THE CANADIAN MINING JOURNAL.

Catalogue No. 3, of the Montreal Steel Works Limited, is a handsomely printed and bound work, designed to facilitate the ordering of springs, steel castings, switch material and other articles manufactured by the company.

A. O. Norton & Company, of Boston, Mass., and Coaticook, Que., are sending out a neat and instructive catalogue of their ball-bearing jacks.

"Suuction Gas Plants" is the subject matter of a pamphlet issued by the Economic Power, Light & Heat Supply Company, of Toronto, Ont.

The Canadian Westinghouse Company have adopted the "loose leaf" system to their distribution of catalogues. Their customers are supplied with serviceable binders and the catalogue is forwarded on the installment plan as monthly circulars, in which are described the new lines manufactured by the company.

Bulletin 22, being instructions for erecting and running the No. 5 Wilfley concentrator, is being sent out by Mussens Limited.

We would acknowledge the receipt of three handsome and instructive catalogues from the Chrome Steel Works, Chrome, N.J., dealing respectively with (1) Chrome steel stamp mill wearing parts, (2) rolled shells and rings, (3) Canda tempered steel jaw plate.

Messrs. Sheldon & Sheldon, Galt, Ont., manufacturers of drying, heating and ventilating appliances, forge and cupola blowers, exhausters, etc., have adopted the plan of issuing tehir catalogues in sections. These booklets, which are perfect gems of the printer's art, are more than mere catalogues. They are, indeed, text-books on the subject mechanical draft in all its forms. Copies will be sent on application to interested parties.

An exhaustive catalogue, illustrative of the use of the Davis-Calyx diamondless core drill, is number K53 of the Canadian Rand Company Limited, Montreal.

Proper methods for thawing dynamite are explained in a neat booklet published by the Dupont Company, selling agents for the McBeth Fuse Works, Pompton Lakes, N.J. The same people are sending out an instructive folder on exploders and batteries.

"Mine Cages, Skips and Ore Cars" is the title of Circular No. CA-3, a handsomely gotten up booklet, issued by the Wellman-Seaver-Morgan Company, Cleveland, Ohio.

A rather exhaustive treatise, of nearly a hundred pages, copiously illustrated, has been issued by the Standard Diamond Drill Company, of Chicago, covering the history, development and use of the diamond drill.

A handbook and illustrated catalogue of engineers' and surveyors' instruments of precision has been received from C. L. Berger & Sons, Boston, Mass. It is a book of some two hundred pages, and full of useful information in regard to the use of all sorts of delicate scientific and engineering instruments.

The Peabody Coal Company, Chicago, have published a most complete atlas of the shipping mines and coal railroads of the central commercial district of the United States, accompanied by valuable chemical, geological and engineering data. The atlas is 16 3-4 inches by 18 inches in size, 149 pages, is serviceably bound in handsome green cloth covered board, and is printed on paper of excellent quality. The atlas was compiled by A. Bement, and is published at $5.00.

MARKET REPORTS

London, week ending March 23rd.—Copper—The market is still unsettled, but a fresh buying movement is expected. Tough is quoted at £115 10s. Electrolytic at £117 10s. to £119.

Tin.—Large transactions and pronounced movements in values in this market. English ingot tin is quoted at £190.

Lead—After a weak opening, this metal recovered all lost ground; £19 15s. to £20.

Spelter has improved to £26 10s.

Iron and Steel—This market is in good shape. Cleveland iron is quoted at 54s. 5d.

Antimony—£98 to £100.

Quicksilver—£7 per bottle.

Silver—30 7-8d. spot and 30 5-8d. forward. Fine silver, 33 5-16d. spot, and 33 1-16d. forward.

New York, March 27th.—Lake Copper—Per lb., 25 1-2 cents.

Electrolytic Copper—Per lb., 25 cents.

Silver—Per oz., 66 3-8 cents.

Tin—Per lb., 40 1-4 cents.

Lead—Per lb., 6 cents.

Spelter—Per lb., 6 8-10 cents.

EXPERIENCED MINING MAN open for engagement after April 20th, capable of taking charge. Address "Cordova", care of Canadian Mining Journal.

INDUSTRIAL NOTE

The Cleveland-Cliffs Iron Company has placed an order for a 60-drill Sullivan air compressor for its new Maas Mine at Negaunee. Michigan. The machine will be of the Corliss-Cross compound condensing two stage type, with large receiver intercooler. The steam cylinders will be 24 x 46 inches in diameter, with a 48-inch stroke, and the air cylinders 40 x 24 x 48 inches, with a displacement capacity of 4,000 cubic feet of free air per minute at 60 R.P.M., or nearly 5,000 feet at 70 R.P.M. The compressor will be built at the Chicago works of the Sullivan Machinery Company.

COBALT ORE STATEMENT

Period—March 25th, 1907, to March 30th, 1907. Coniagas Mine shipped to American Smelting & Refining Company, Perth Amboy, N. J., 65,070 lbs.; Nipissing Mine shipped to Nipissing Mining Company, New York, 42,200 lbs.; O'Brien Mine shipped to Canadian Copper Company, Copper Cliff, 81,860 lbs.; Cobalt Townsite Mine shipped to Canadian Copper Company, Copper cliff' 43,000 lbs.; Trethewey Mine shipped to American Smelting & Refining ompany, Per Amboy, N.J., 60,090 lbs.; Trethewey Mine shipped to American Smelting & Refining Company, Perth Amboy, N.J., 41,560 lbs.; O'Brien Mine shipped to American Smelting & Refining Company, Perth Amboy, N.J., 64,130 lbs.; Right of Way Mine shipped to Anglo-French Nickel Company, Swansea, South Wales, England, 3,800 lbs.; Nipissing Mine shipped to Nipissing Mining Company, New York, 75,520 lbs.

TAILINGS

The great English-French-German technical dictionary, begun in 1901 under the auspices of the Society of German Engineers, is nearing completion, and printing is to begin early in 1907. Over 3,000,000 word cards have been collected. Dr. Hubert Jansen, of Berlin, is editor, and about 2,000 firms and individuals in Germany and elsewhere are assisting in compilation.

While the electric furnace cannot compete with other processes in the general production of iron and steel, Dr. R. S. Hutton, the British metallurgist, finds that it may be used to advantage where water power is cheap, and that it has a fairly clear field in the manufacture of iron alloys not easily made in the blast furnace. Many electric plants have been established in Savoy and Isere, in the south of France, the furnaces ranging from 200 to 2,000 horse-power. At Grenoble five furnaces of 1,200 horse-power and four of 2,000 horse-power are used to produce ferro-silicon, ferro-chomium, silico-spiegels of varying composition, and manganese-silicon, and the output is between 7,000 and 8,000 tons a year. The Giraud works, soon to be enlarged, now have an output of about $1,700,000 per year from furnaces of 18,000 horse-power. The product is 5,000 tons of ferro-sicilon of 50 per cent. and 1,000 tons of 30 per cent., 2,000 tons of ferro-chromium, 900 tons of ferro-tungsten, 50 tons of ferro-molybdenum, and 10 tons of ferro-vanadium.

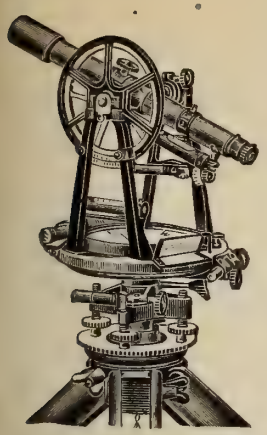
One of the largest blowers ever built in Canada is being built by Sheldons Limited, of Galt, for the Diamond Coal Company of Calgary, for ventilating their mines near Lethbridge.

The blower, which is all of steel, will stand, including foundation work, 27 feet high. It will weigh 14,000 pounds, and will deliver 156,000 cubic feet of air per minute under a pressure of one ounce per square inch. The wheel is 16 feet in diameter and 6 feet wide, and will be driven by a 75 horse-power Westinghouse motor, and, under full load, will make 105 revolutions per minute.

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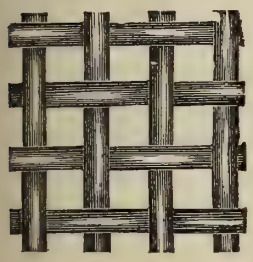
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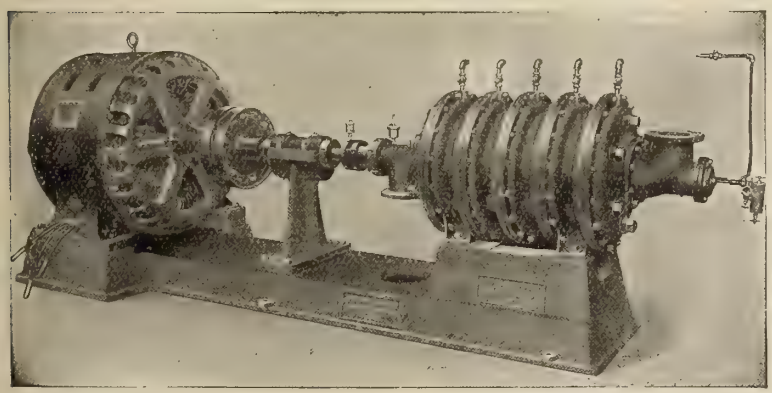
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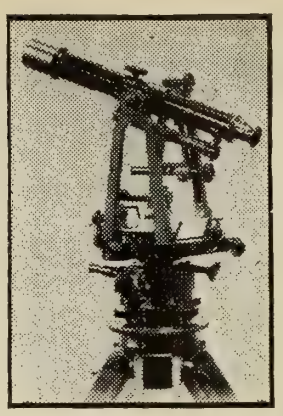
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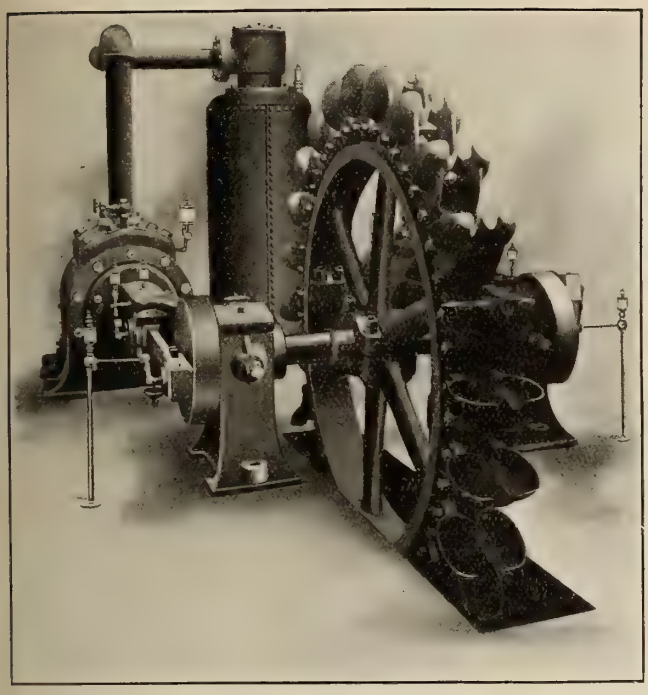
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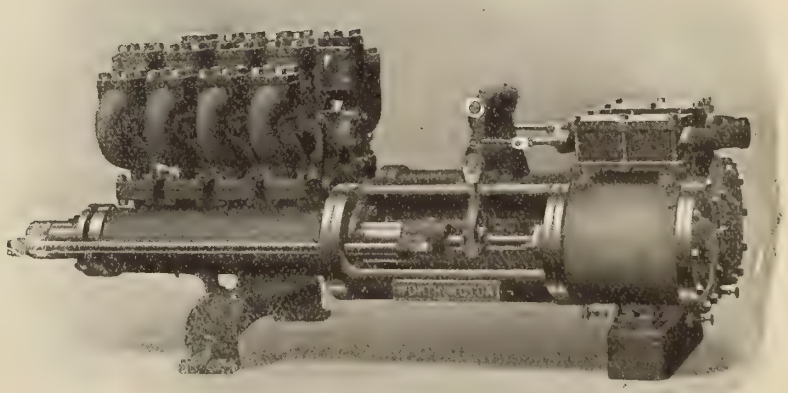
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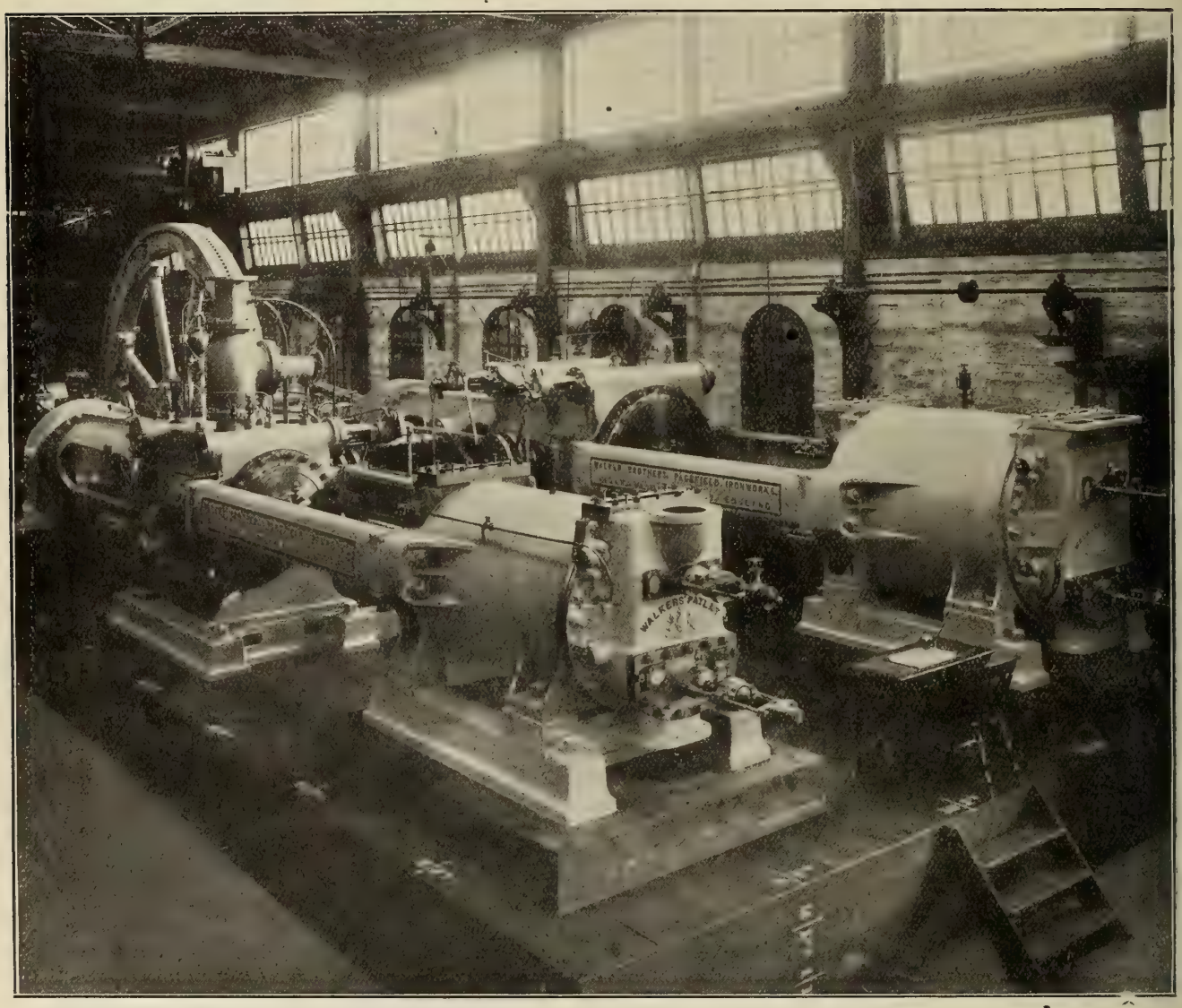
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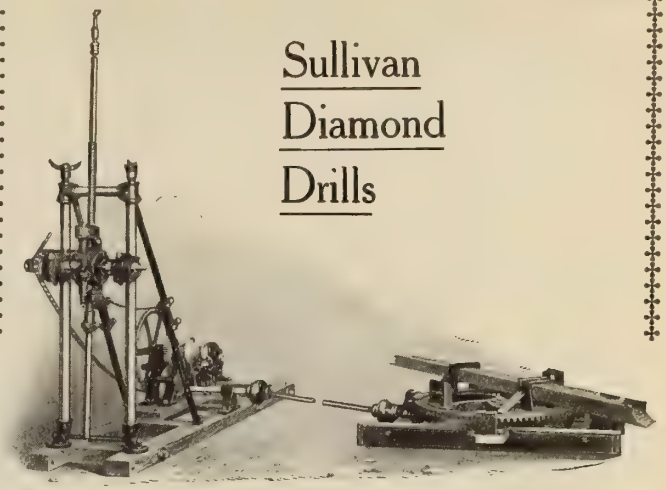
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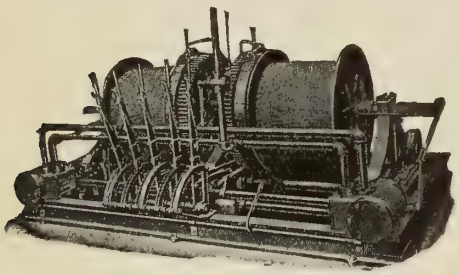
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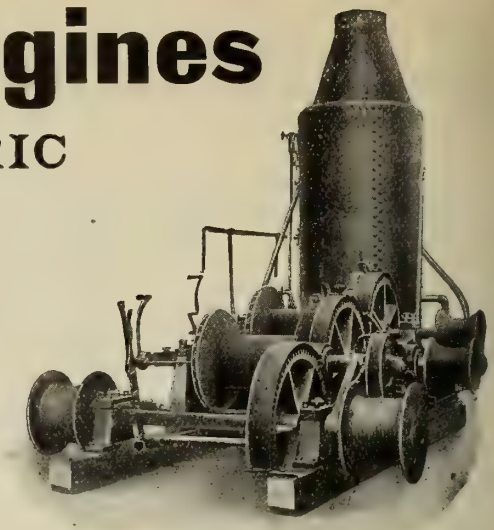
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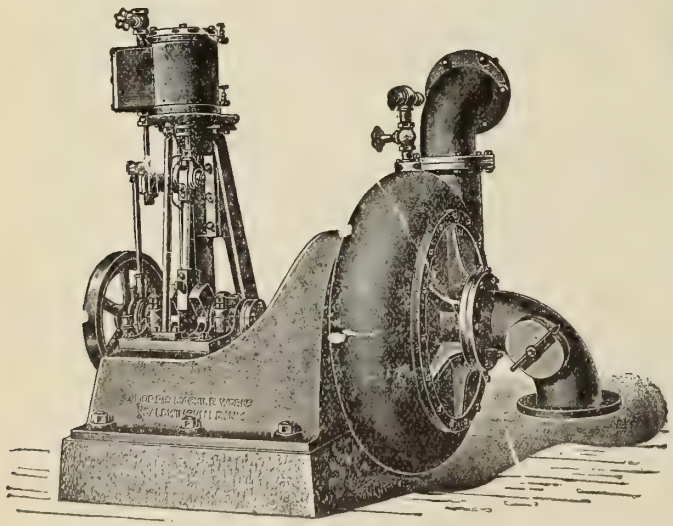
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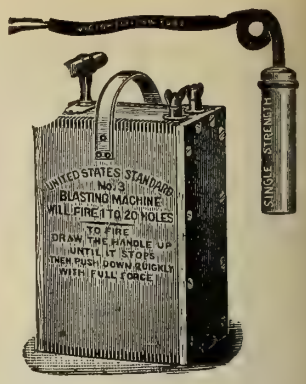
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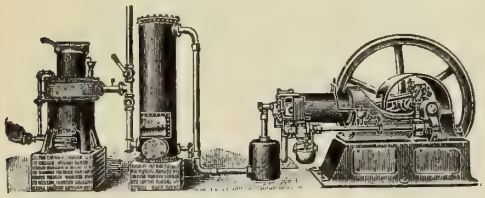
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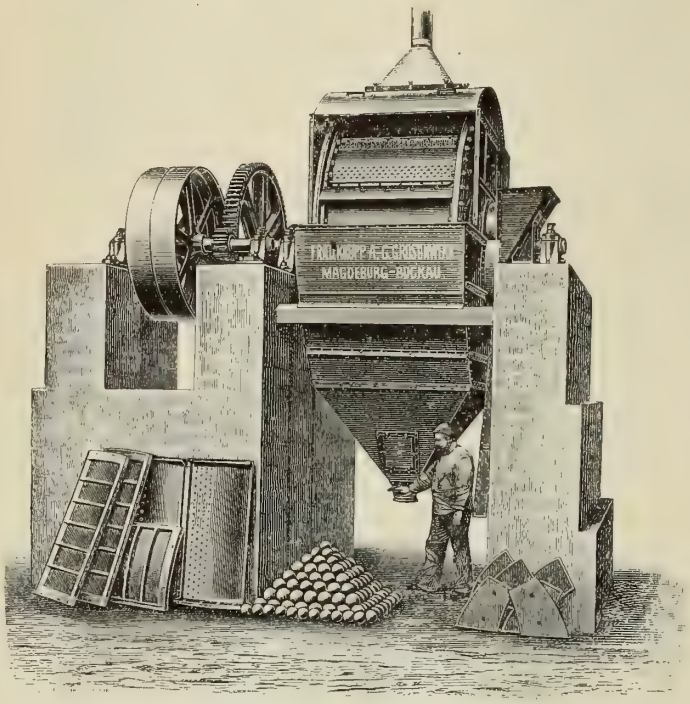
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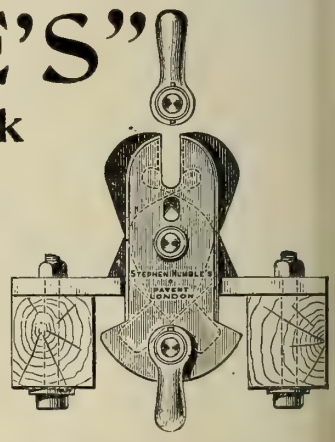
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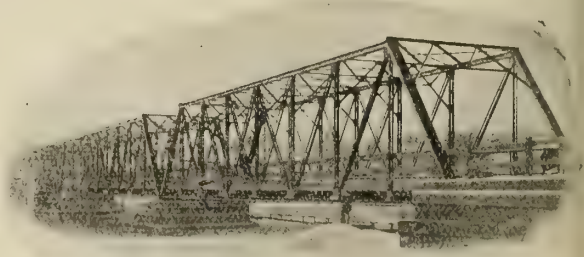
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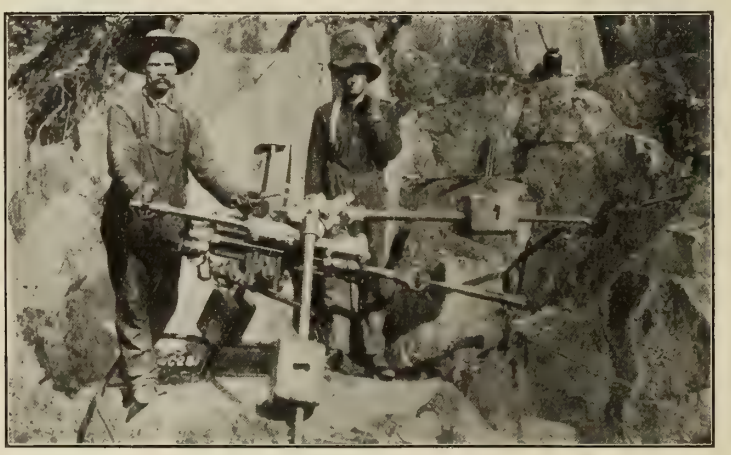
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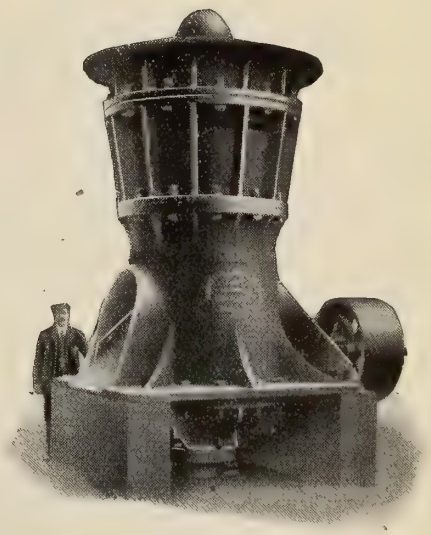
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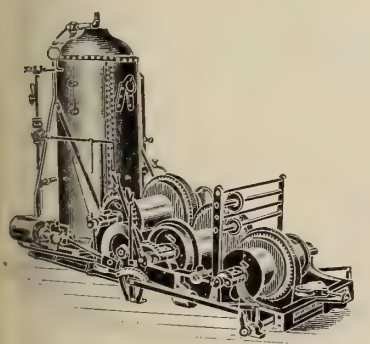
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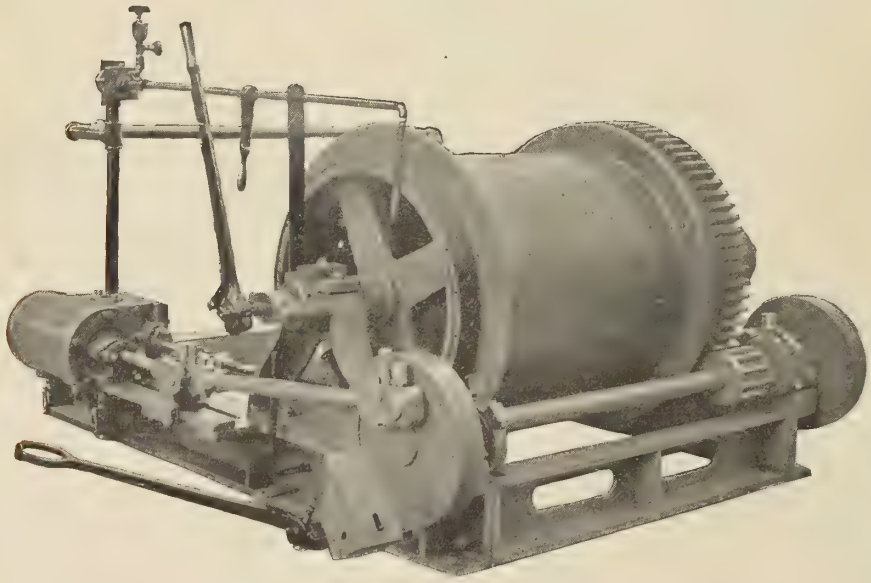
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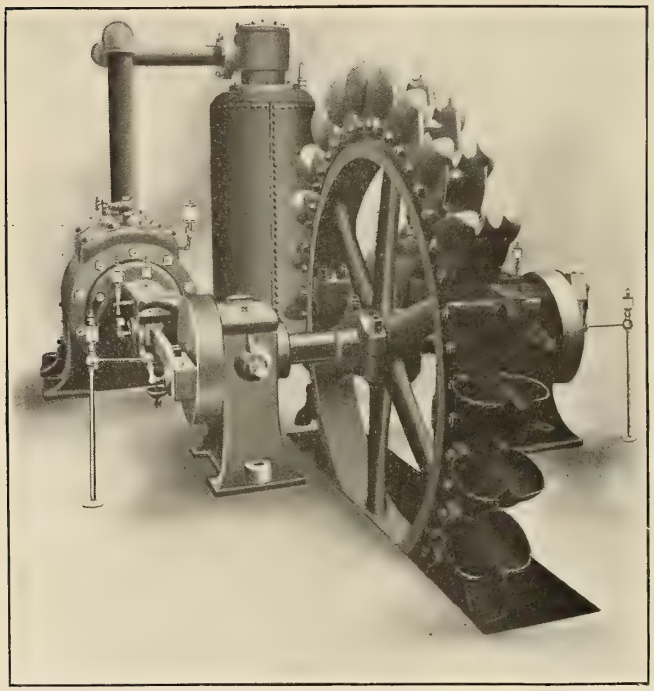


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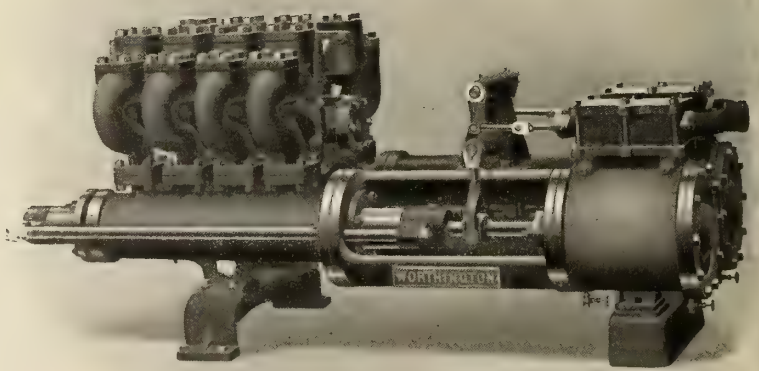
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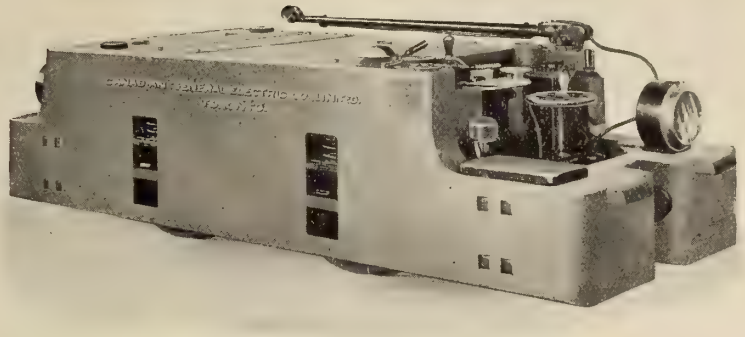
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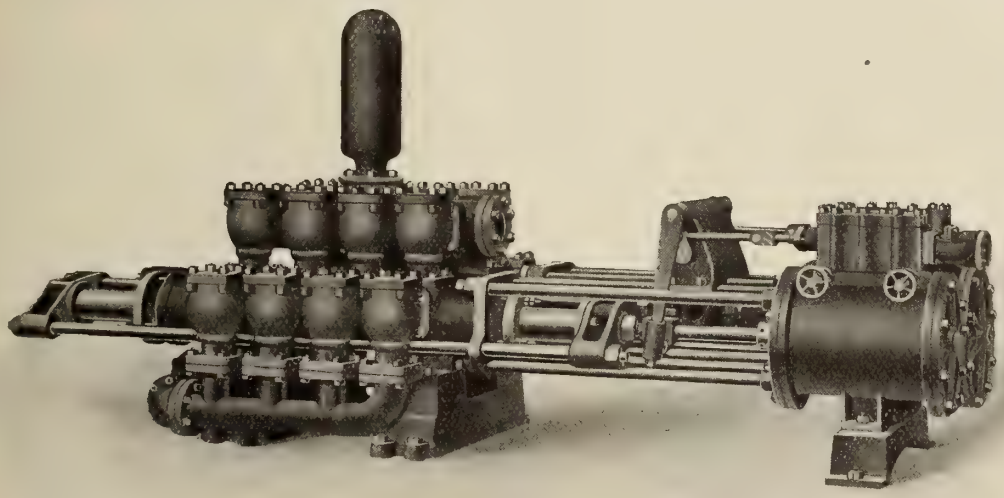
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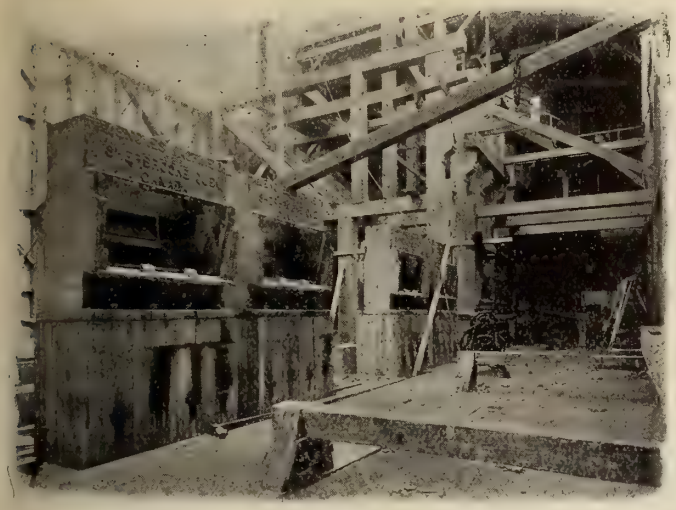
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REFERENCES:— Prof. R. Bell, Chief Geologist Dominion Geological Survey, Ottawa. The Molsons Bank, Port Arthur, Ont. The Mayor, Port Arthur, Ont. Prof. R. Carr-Harris, Royal Military College, Kingston, Ont. Board of Trade, Port Arthur, Ont. Board of Trade, Fort William, Ont.

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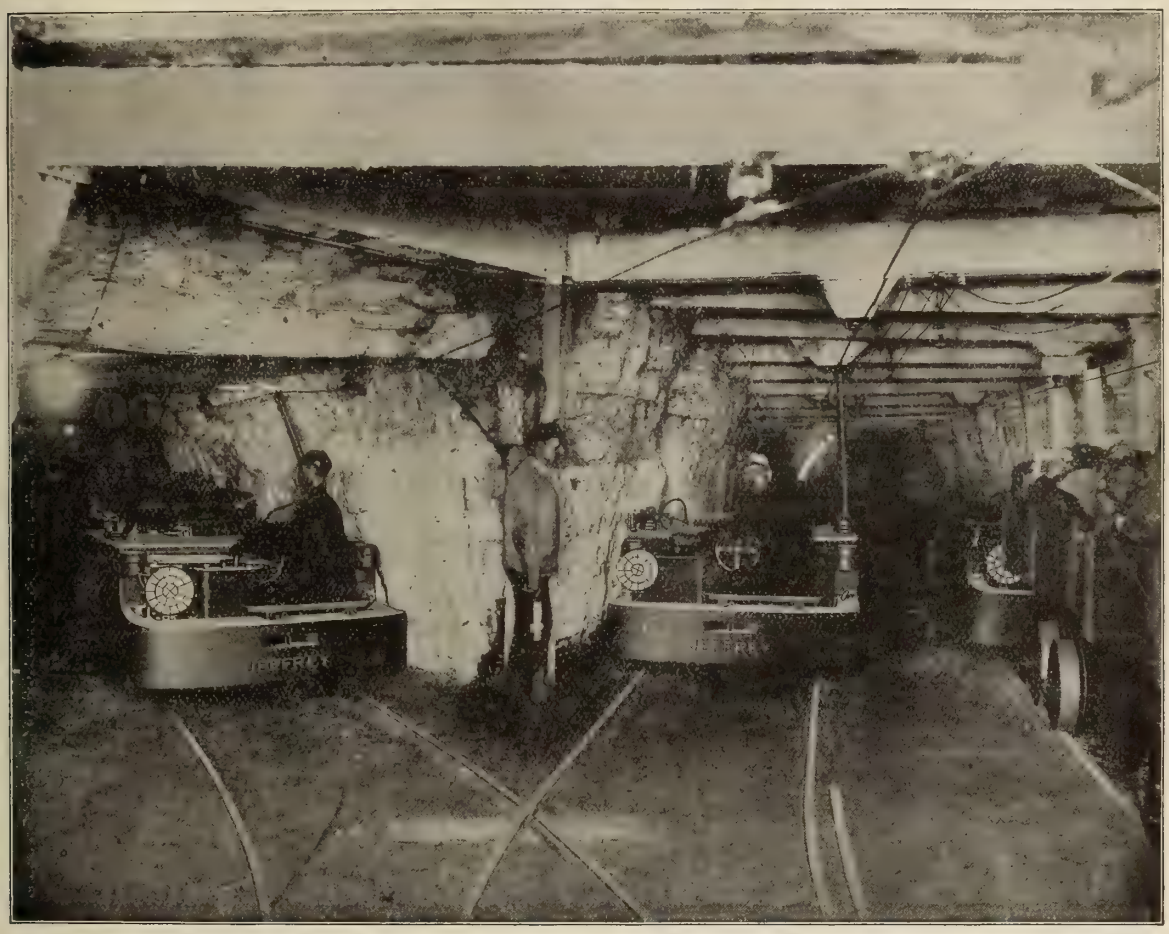
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The fee for recording a claim is $5.

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The patent provides for the payment of a royalty of 2½ per cent. on the sales.

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The output of iron, copper, nickel, silver and cobalt in 1906 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

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For reports of the Bureau of Mines, maps, mining laws, etc., apply to

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All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows:

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel, and also graphite, asbestos and phosphate of lime; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

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Patents are obtained subject to the following conditions: The full price must be paid in cash; specimens must be produced and accompanied by an affidavit; a survey at the cost of the applicant must be made on unsurveyed lands; work must be bona fide begun within the two years.

Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey, 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

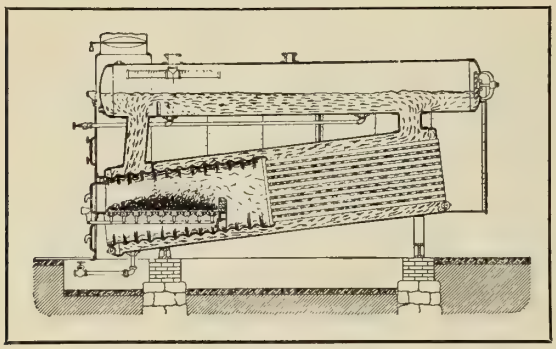
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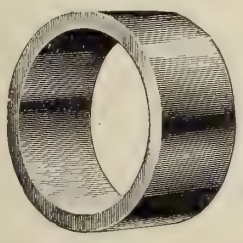
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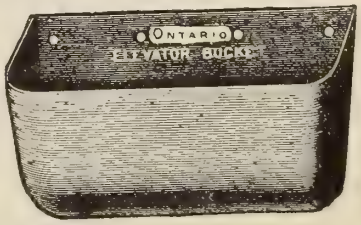
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THE REGISTRAR,
McGill University, Montreal

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THE OFFICIAL ORGAN OF THE CANADIAN MINING INSTITUTE

VOL. I, No. 4, New Series TORONTO and MONTREAL, MAY 1, 1907 Old Series, Volume xxviii., No. 6

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Editors:

J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMB
Sec. Canadian Mining Institute

Business Manager . . . J. J. HARPELL, B.A.
Asst. Bus. Manager . . D. B. GILLIES, B.A.
Circulation Manager . . . A. P. DONNELLY, B.A.

SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario. Dr. J. A. Woodman Dalhouse University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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WESTERN FUEL SITUATION

As we go to press the reports from the West are disturbing. More than one thousand coal miners are out on strike. The supply of fuel for the railroads is rapidly reaching the vanishing point. A fuel famine threatens the whole West, from Winnipeg to British Columbia. Unless an immediate solution is reached, traffic will be almost altogether stopped, factories closed and smelters shut down.

The president of the United Mine Workers' Union, in responding to an urgent telegram from the Minister of Labour, requesting the miners to await Government investigation, characterized the investigation as a farce, and threatened to "carry this fight to the foot of the throne." The president's intemperate message is the sort of indiscretion that does incalculable injury to the labour cause Instead of attempting in every way to aid the Minister in peacefully solving the difficulty, the miners' representative breathes fire and slaughter. In pursuing this course he antagonizes public sympathy (that most potent factor in deciding any such struggle) and places the body of men whom he represents in a very false position.

Under recent legislation the Minister is endowed with certain powers. We hope that these powers will be used to their utmost in promptly putting an end to this strike. It is iniquitous that the country should be subjected to enormous loss, that many of its most important industries should suffer indefinite suspension merely because the leaders of labour organizations are not amenable to reason.

Whether the fault lies with the operators or with the miners is immaterial. It is an utter anomaly that either corporations or individuals should have it in their power to inflict grave loss and permanent injury upon the country at large. The men, or the corporations, who deliberately tie up traffic and cause a suspension of industrial activity, should be held criminally responsible, and should suffer the full rigor of the law. Canada has had her full share of labour difficulties. It is high time that disturbers of the public peace should be dealt with promptly and severely.

DEVELOPMENT

A new stability is lent to the market for Cobalt ores from the fact that Welsh and German smelting firms are sending inquiries and offers. One mine in Cobalt received an offer of terms as follows: Ore carrying 1,000 ounces silver to the ton, 93 per cent. assay value; ore carrying under 1,000 ounces silver to the ton, 92 per cent. assay value; cobalt under 7 per cent., 20 cents per pound; between 7 per cent. and 10 per cent. and over 10 per cent., from 20 cents per pound to 40 cents per pound. Nickel also is sought at 10 cents per pound on ore carrying over 5 per cent. The opening of a larger market for cobalt and nickel will encourage conservative mining, and will render "gophering" less excusable. Anything that will lead to the sane exploitation and rational development of Cobalt mines at this stage of their history will inevitably lengthen the life of the camp and vastly increase its ultimate value.

CRITICISM

The Mining Journal (London, Eng.), in acknowledging receipt of Vol. I., No. 1, of THE CANADIAN MINING JOURNAL, makes the following comments:—

"We have received from the publishers a copy of the above journal, which, as the reference to an "old series" indicates, is our old friend, the "Canadian Mining Review" masquerading in new clothes. Right here, to adopt the Transatlantic idiom, we desire to make a protest. A journal with a well-recognized name does not change its title without careful consideration, and the choice of a name so similar to our own raises the inference that the proprietors look upon the certainty of confusion as desirable. In fact, they go so far in the first number as to refer to their paper as 'THE MINING JOURNAL,' *sans phrase*. Such action would in this country be preventible by injunction, but, of course, as matters stand we have no remedy. The practice is analogous to the action of the company promoter who, encouraged by the success of a well-known mine, adopts a title which is as close an imitation as he dare, and which is often the only asset of value which the concern possesses. We do our best to avoid inflicting any personal matters upon our readers, but the action of our resuscitated contemporary's proprietors, with the whole English language open to them, of selecting the title they have leaves us no alternative but to protest against what we can only regard as an unfriendly act."

We regret that our respected contemporary has so far forgotten the laws of courtesy as to indulge in this somewhat painfully plain language. We are sure that upon mature reflection it will regret this hasty judgment.

THE CANADIAN MINING JOURNAL at its inception was entirely distinct from "The Canadian Mining Review." The former name was chosen for the new venture for no other reason that that it was conveniently distinctive and short.

The publishers have aimed at producing a sound representative and (so far as may be) attractive technical magazine, with an individuality of its own. The absorption of "The Canadian Mining Review" modified the original plans only in details.

On the other hand, it is difficult to imagine in what possible respect we could be the gainers in designedly stealing our worthy contemporary's title, or, indeed, any other feature. We are publishing a Canadian magazine, dealing with the mining and metallurgical industries of Canada, and our requirements are of a very different nature from those of the London "Mining Journal."

We have made this rather lengthy explanation because we know that our London namesake is neither frivolous nor irresponsible. We are sincerely sorry to have given it offence. That there is, so far as we are concerned, any cause for this offence, we do not admit, and we are sure that our contemporary will willingly withdraw its hasty condemnation when it has had time to reflect.

COBALT LAKE

The Ontario Legislature has passed an Act validating the letters patent which grant to the Cobalt Lake Company the minerals under Cobalt Lake. This Act has been passed, despite the fact that the Florence Mining Company claim to twenty acres of the lake is now *sub judice* .

Concerning the merits of the case, as between the two mining companies, we have nothing to say. The courts will decide this in due time. The action of the Local Government, however, appears to be at least ill-advised. It is highly questionable, indeed, whether the Government is acting within its powers when it arbitrarily decides a case while it is yet in the courts.

BRUCE MINES

The annual report of the Copper Mining & Smelting Company of Ontario, Limited, submitted to shareholders at the recent annual meeting in London makes, on the whole, excellent reading, and many of our readers will be gratified to learn that with good management there is now every prospect that the historic Bruce Mines will ere long be placed on a permanently profitable footing. Actual mining was not commenced before last August, and during the four months following 3,371 tons of ore were raised, and 1,295 tons left in the stopes, the gross profit on which is estimated at $34,000. It is expected that the concentrator will be in operation early in the summer, and that 30,000 tons of ore will be treated, averaging in value $10.50 per ton. The company propose to send their product for treatment to the Sault for the present, but the erection of a smelter on the property is under contemplation. Last autumn a number of important new discoveries were made at the mine, including a lead of bornite, some two miles distant from the main workings. At the conclusion of his speech to the shareholders, the general manager referred to the negotiations that are now proceeding for the extension of the seventeen miles of railway from Bruce to connect with the Grand Trunk Pacific to Hudson's Bay, through an important timber and mineral area. He expressed the opinion that the development of this line would undoubtedly enhance the value of the company's property and tend to make the town of Bruce an important coaling and mining station.

CONSOLIDATED MINING AND SMELTING CO.

The showing made by the Consolidated Mining & Smelting Company of Canada, since the consolidation was effected some two years ago, is eminently satisfactory, and we extend to Mr. W. H. Aldridge and his staff hearty congratulations thereon. The distribution of profits in the form of dividends to shareholders during the period mention has aggregated the large sum of over half a million dollars, and a sixth dividend of 2 1-2 per cent., payable on May 1st, has just been declared, which increases the total to nearly $700,000. While the advance in the price of metals has, of course, largely facilitated the profitable operation of the mines, the result is also in a great measure due to the economies effected by the consolidation and subsequent good management.

EDITORIAL NOTES

A press despatch states that the miners at the Fernie collieries have, by a large majority vote, decided in favor of a strike. This will mean the general suspension of mining activity throughout Southern British Columbia until the dispute is settled. The metalliferous mining industry, which was never in a healthier condition, is thus at the mercy of an aggregation of coal miners, largely foreigners, and dominated by an alien labor organization with headquarters in the United States. Such a state of affairs is altogether intolerable and calls loudly for remedial legislation. The strike is ostensibly based on a number of minor differences, but the real object is to force the owners to recognize the principle of the "closed shop."

Mr. George Otis Smith has been chosen as the new Director of the United States Geological Survey. It is significant that Mr. Smith is but thirty-five years of age. He has, however, served for fourteen years on the Survey. The Canadian Mining Journal wishes Mr. Smith a long and useful tenure of office.

The Premier of British Columbia took a very wise step in announcing the imposition of a tax upon all iron ore exported from the Province. Both this tax and the bounty on native ore smelted will operate to encourage the erection of smelters in the Province. There is no reason why British Columbia should not have a thriving iron industry.

The Atlin Claim of March 30th, in an editorial headed "False Stampedes," condemns the spreading of exaggerated rumors of gold finds. It refers particularly to the report that the richest strike made in Alaska had been discovered on the south fork of the Kuskokwin River. While it does not deny the actual discovery of gold, The Atlin Claim deprecates the overdrawn accounts of the nature of the strike, and predicts hardships and privations for many disappointed prospectors.

THE PRACTICAL MINING MAN

In these degenerate days a trademark, or a catchy phrase, possesses a very positive value. Thus, bad butter, carefully decked and labelled "Fresh Dairy," may command a larger market than the paler, purer article straight from the farm. Patent medicines, concocted of alcohol and incidentals, christened with an attractive name, are eagerly bought.

In the business of mining these snares and delusions have their counterparts. Of the *bona fide* practical man the public hears but seldom, or never When he is heard of, it is mostly in connection with smelter returns, or mine output, or in some such prosaically profitable manner. Like most common mining men, he must earn his living and do a minimum of talking. This is the genuine, undecorated brand.

But there is another brand, a variety that announces to all the world that he is a "practical miner," and that, knowing the business of mining from Alpha to Omega, he is the safest and surest guide for the purchaser of mining stock.

We wish to condemn no one. But it is worth while to observe carefully that the mining man, the practical man, who is following the profession of mining, and who possesses the confidence and respect of his fellows, is, of all men, least given to blatant self-advertisement. The practical man has every right to protest against the sinful misuse of his title.

SINKING THE ALLAN SHAFTS

(H. E. Coll, M.E. Paper read before the Nova Scotia Mining Society.)

Description and Location.

The Allan Shafts are located in the north end of the town of Stellarton, Pictou County, N.S., and are 1,000 feet from the old Ford Shaft. They were sunk with the idea of cutting the Ford, Cage, Third and McGregor seams on their basin and lowering the north and south coal by means of balances or chutes to the shaft level, thence up the shaft to the surface.

It was decided to make both shafts the same size compartments, guides and timbering, and to place one 350 feet north of the other. In this way whichever shaft proved the most suitable could be utilized as the main hoisting plant.

The size of the shafts is 12 feet 4 inches by 24 feet, outside of timbering. All timbering is of Florida yellow pine, and the dimensions and joints are shown by the accompanying plan. Each shaft is divided into two hoisting compartments, 6 feet 10 inches by 10 feet 4 inches, and one air-way 6 feet 10 inches by 10 feet 4 inches. The air-way is separated from the middle hoisting compartment by two thicknesses of 1 inch yellow pine groove and tongue flooring, having end joints and side joints broken and overlapped.

Equipment.

Head Frames.—A head frame at each shaft was constructed 44 feet high to a centre of a 5 foot sheave wheel. The details are shown in the accompanying blue print. Instead of a brace leg, the head frame was held by two 3-4 inches rope guys that fastened underneath the rear cap piece, and at the other end were attached to concrete dead men. All hoisting was done in the centre compartments. These head frames were light and easily built, yet answered fully to the rough service given them. In fact, the one at No. 2 shaft is still in use, as by making some changes and adding bracing, we have adapted it to coal hoisting in both compartments.

Across the top and close to the rope line a 10 inch by 12 inch by 18 foot yellow pine cap was placed, with the ends extending out 4 feet on each side. This was for the purpose of hanging a 3-4 inch chain 30 feet long, and which ended in an open hook and was used for swinging the buck out in position to dump into the muck car.

A special hook was used in fastening the muck basket on to the rope. It had a spring latch, which would allow the bale of the bucket to enter and then spring shut. In changing buckets, the operator had to open this latch by hand. The buckets were 3.25 feet diameter, 2.5 feet deep, and had a volume of 20.74 cubic feet. Weight of bucket was 700 lbs., weight of muck contained in bucket, 1,900 lbs.

Compressor.—Compressed air was supplied by one class G. Ing. Sar. machine, having steam cylinder 16 inches by 26 inches by 18 inches, and air cylinders 16 1-4 inches by 26 1-4 inches by 18 inches. This machine being air-governed, worked only as the air was drawn from the mains. The capacity of the machine is 1,327 cubic feet free air per minute, delivered at a pressure of 100 lbs.

Drills.—The drilling was done by 8 Ing. Sar. 3 inch drills of the D 24 auxiliary valve class.

Ventilation was supplied each shaft by a 5 1-2 by 8 1-4 Sturtevant steel place fan having a capacity of 20,000 cubic feet of air. These fans were not required during the sinking, except after shooting, when they were speeded up to their capacity in order to clear the shaft of the dynamite fumes.

Power was supplied by two 200 horse-power Sterling boilers, placed midway between the two shafts.

All the muck coming from both shafts was conveyed by means of a specially built dump car to a ravine just south of No. 1 shaft, which made an ideal dumping place, and at the same time was making room for shops and other buildings.

Hoisting Engines.—Thirty-eight feet from the rope centre of each head frame a pair of Lidgerwood friction drums and brake reversible engines, having 10 inch by 12 inch cylinders, and 5 foot drum, were set up on timber foundations and equipped with a 3-4 inch non-twisting wire rope. These engines were only used for a portion of the sinking, as will be shown later.

Labor.—The work was divided into three eight-hour shifts; each shaft consists of from seven to ten men. The shift bosses worked twelve hour turns, and a walking boss had direct control of the sinking in both shafts, and was liable for duty either night or day.

Sinking Operations.

Having given a description of the equipment, we now come to the actual work of sinking.

Ground was broken on April 26, 1904, in No. 1 Shaft, and on May 2 in No. 2 Shaft. As the operations and rock are identical, we will take No. 1 Shaft until we reach the coal.

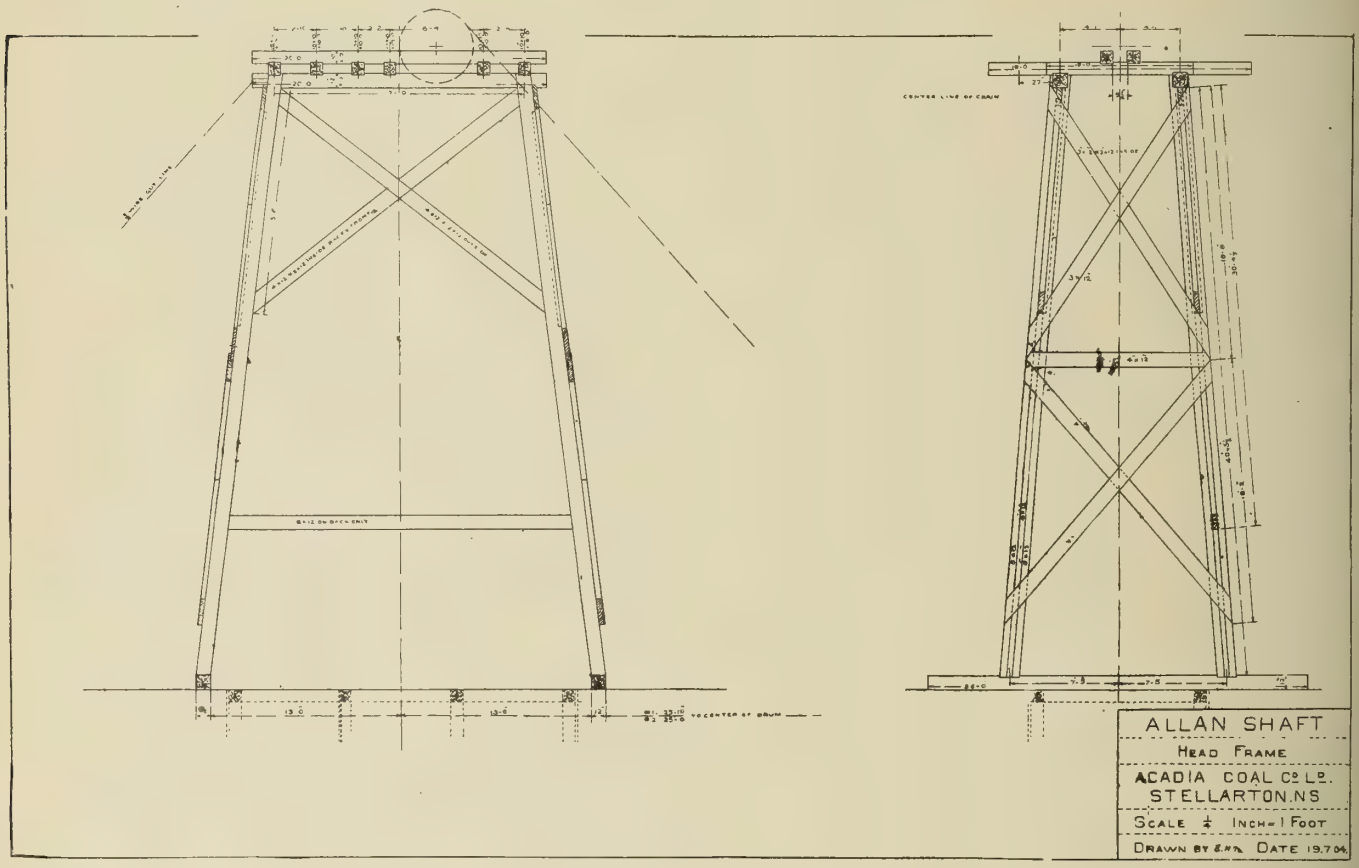
After going a depth of 12 feet in fairly firm top clay, a bed of gravel was met containing considerable water. A delay of two days was occasioned, by which time an injector had been rigged, which soon had the water under control, and sinking recommenced.

After passing through six feet of loose shale and gravel, and having gotten in place five sets of timber, the sinking passed into very fine sand, and this, mixing with the water and clay from above, made very soft mud. At a depth of 23 feet the walls began to give way, and to prevent this a line of poles 4 feet 6 inches long were driven in a lateral direction, but with no avail. The wall on the southeast end began to sink, carrying the timber with it on that side of the shaft.

Skin timbering of spliced sets was immediately commenced, and, after much difficulty and very slow work, twelve sets were secured in place. At this depth a firm blue clay was met, which proved to rest directly on top of the shale at a depth of 43 feet. Three regular sets of timber were then put in, below which the first yellow pine hitches were placed at a depth of 51 feet.

During the entire month of May only 47 feet had been sunk, and of hemlock timber that had been placed not a single set was in proper position. The east side plates were two feet below the level of the west side, and where the spliced plates had been put in the skin timber, eight of the twelve plate had given way at the splices and were closed up to 10 inches towards the centre of the shaft.

On the whole it was a bad start, and it was decided to go on sinking the shafts, leaving the top of No. 1 remain as it was until the sinking operations were finished. Commencing in June, the sinking was in the regular shale formation lying at an angle 30 degrees from north to south. The amount of water was not heavy, but sufficient for the use of the sinking pump. For this purpose a Jeansville sinker, size 5a, 7 inches by 4 inches by 12 inches, operated by compressed air, was used, and gave excellent satisfaction down to 500 feet depth. At this point it was replaced by a Cameron sinking pump, 12 inches by 4 inches by 13 inches.



Two rings were put in this shaft. The first at a depth of 75 feet, and after sinking further it was discovered we were getting a regular stream below this point, whereupon a second ring was cut at a depth of 200 feet. A pump was placed, and the water has been handled from this ever since. These rings were made by cutting into the rock two feet back from timber line all round the shaft. At the south end a sump was cut four feet deep by three feet wide and the whole lined with six inches of concrete.

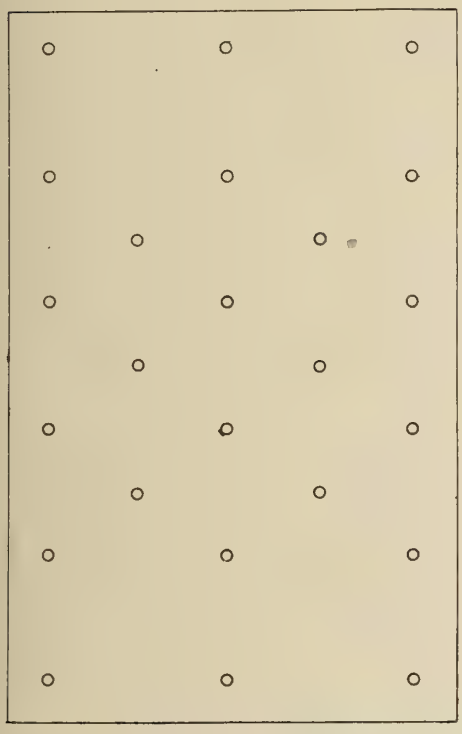
Sinking was continued with very little delay, and very little change in the measures, and at this point we will give an outline of the method used in the sinking operations.

Sinking.—Starting with a clean bottom, two 4 1-2 inch shaft bars 12 feet long would be lowered to the shaft bottom, and set up crossways about 4 feet on each side of the centre line. Four drills were then lowered, one at a time, and two mounted on each bar. The first row of sump holes are started with the machine clamped on the outside of the bar on a slant of about 10 degrees.

All this takes about one hour. The drill steel is handled in big steel cases like large golf bags. Two sets of steel are lowered for the four machines. The air is carried down the shaft in a 2 inch line, with a header on the end having five connections.

While the machines are being mounted, a pair of men take four lengths of 50 foot hose in the bucket and couple them to the header, the drill runner couples on to his machine and is

ARRANGEMENT OF HOLES FOR 1 ROUND OF SHOTS.



AVERAGE CHARGE IS 6 STICKS OF 12" DYNAMITE PER 12" HOLE

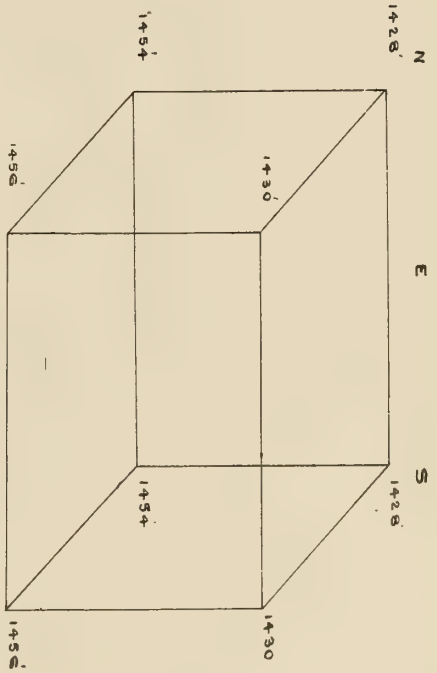
ready to start. It took two men to each machine. The helper mounted the bar and fed the drill, while the drill runner handled the throttle. As soon as the first row of holes were finished the drill was thrown over to the inside of the bar and the second row commenced. There was very rarely over half an hour's difference between the four machines. The average time for drilling a hole was two hours, and for a sump of 12 holes it averaged about 8 hours. As soon as a crew had finished, their machine and gear were hoisted out of the shaft, so that there was little time lost when the last hole was drilled before they were ready to charge and shoot. The average charge was 6 sticks of 12 inch dynamite to each 12 foot hole, or 72 lbs. charge for each sump. Of course there were occasions when more or less dynamite was used, depending upon the area of sump drilled and the quality of the rock as shown in the drilling. The distance from timber, strength of the walls, and the absence or presence of slips, all governed to some extent the placing of the holes and the strength of the shot. All shooting was done from the surface. For this purpose a twin cable wire, mounted on a small reel at the deck head, was provided, and when the holes were loaded this wire was lowered to the bottom and connection made to the connecting wires of the holes. This work was done by two men, all the others being on the surface. As soon as these men came to the surface the battery was connected up and the charge fired. The fan was at once started at its full capacity for about fifteen minutes, when it was reduced to half speed, and the shift boss and one man went down to examine the shaft timbers and remove any loose rock that would be thrown up by the explosion. When the bucket was sent up empty it was a signal all was clear, and the entire shift went to the bottom to muck out.

Two buckets were used, and they were hoisted as fast as they could be filled by eight or nine men. It took from 12 to 16 hours to muck out a sump. When finished, the bars were lowered and set up at each end for drilling the benches. The bar was set about three feet from the end wall, and the first row of holes was put down almost straight. The angle of the second row depended upon the amount of bench to be lifted. Six holes were drilled in each bench, and the charge in the south end was always heavier than on the north, because, owing to the dip, the north side was easier to pull. The holes were then charged and shot, and the muck hoisted out; thus completing a "round," as it was called. The length of time required to take out a "round" varied from 36 to 42 hours. Besides this amount of muck, there were about 500 gallons of water per hour to handle in No. 1 Shaft; in No. 2 it was about half that amount.

Traveller or Crosshead.

In order to keep the bucket from swinging while going up and down the shaft, a traveller, or crosshead, was used. This was made of 6 inch yellow pine frame, with cross braces. The shoes were formed by bolting pieces of plate at each corner, which lapped over past the guides 2 inches on each side. This cross-

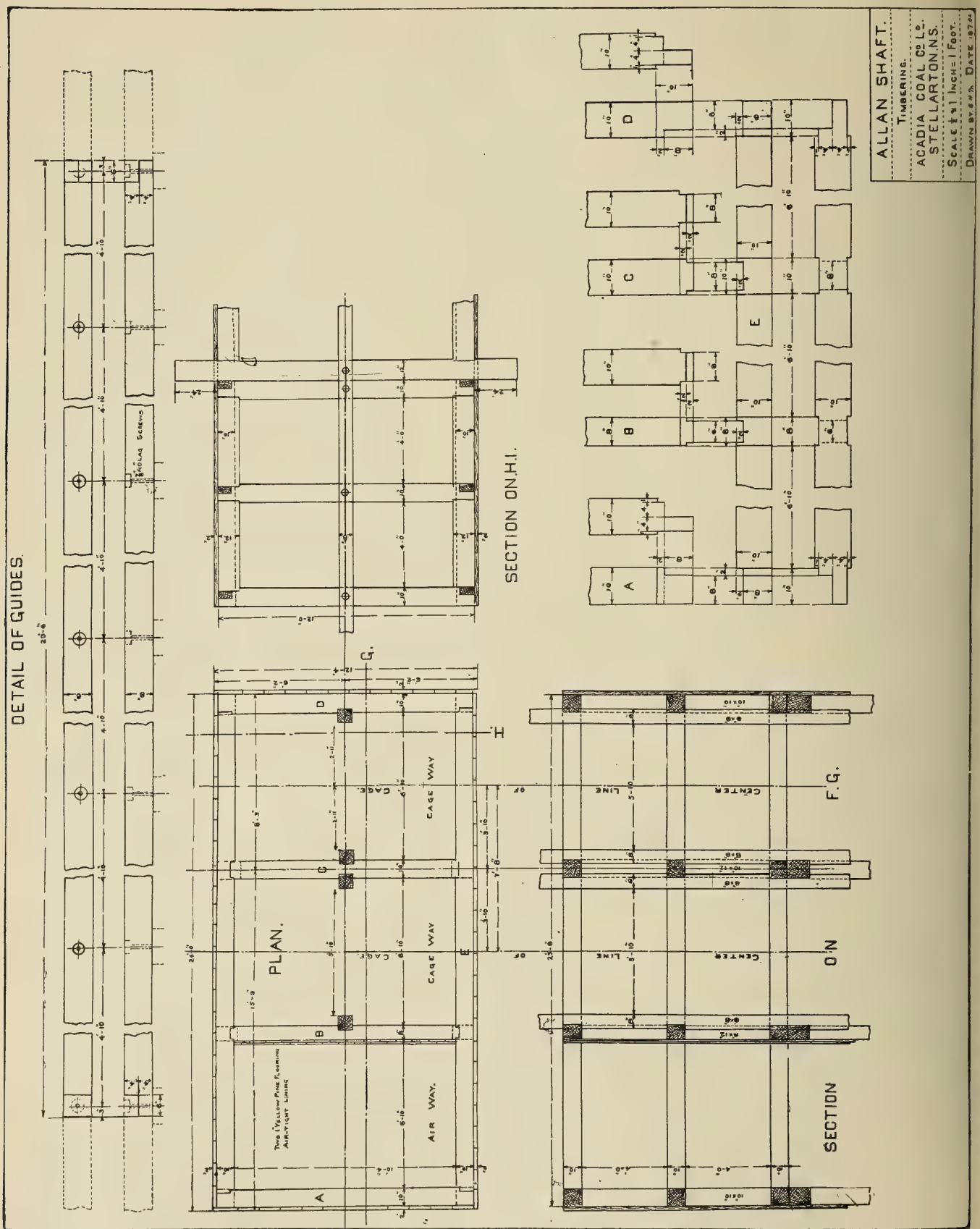
PLAN OF THE CAGE SEAM AS STRUCK IN Nº. 1 SHAFT NOV 22 1905.



head rested upon a ring which fitted down over the rope socket, and the rope went up through the centre. In the top guide a dog was placed, which could be tripped by means of a rope from the deckhead. As each bucket came up out of the shaft it was hoisted high enough to set the crosshead upon this dog, then the deckman caught the crossbar of the bucket with the hook of the bull chain, and the bucket swung out over the dump car and was upset. Within a guide length of the bottom of the timbering, a par of heavy angle plates were bolted on to the guide, and the descending crosshead would seat itself on those plates and the bucket would be dropped down to the sump. When the loaded

bucket was picked up it was steadied a few seconds, and then hoisted slowly till the crosshead was picked up.

After sinking several hundred feet it was found that the 10 inch by 12 inch hoisting engines were not going to be able to handle the work fast enough from the lower depths. Accordingly, two pairs of engines, 20 inch by 30 inch cylindeers, and having drums 72 inches diameter and 90 inch face, were procured from the Exeter Machine Company, of Pittstown, Pa. These engines were supposed to be good for 4,000 feet maximum speed, but day after day these machines reached a speed of 5,000 feet per minute. This explains why faster sinking was done in the lower and harder measures than during the first half of the work.



Method of Timbering.

When the sinking had been carried down as far as had been considered safe, below the timbering, the distance from the last hitch timber to within about ten feet of the bottom was measured, and hitch holes not less than two feet deep were cut in the walks. When these were ready the hitch timbers were lowered from the surface, placed in position and wedged tight. The two side plates of the first set followed, and then came the end plates and buntons. These came down in rotation, and marked for their respective positions. When all the pieces were in place the set was levelled and then wedged plumb by means of bobs suspended from the last timbering. To facilitate this the centre lines were all scored when the framing was being done. The second set was now lowered, and then plates rested upon the posts until the buntons were in place, when this set was levelled and wedged to place. This was continued till the last, or closing-in, set was reached. In order to get the side plates in position, it was necessary to leave out two buntons of the lower set. These closing-in sets were usually either longer or shorter than the standard, as the measurement could not be made true, and the posts were cut to fit the actual distance and driven home.

The two inch lagging was then placed, and made as near watertight as possible. All spaces between the walls and the lagging were closed with packing. After the timbering was in place the guides were fastened on the centre compartment, so as to keep the crosshead as near as possible to the sump. The guides were not placed in the other compartment until the sinking was completed.

In sinking the first 500 feet, a number of slips and slickensides were passed through, but not of enough importance to show any radical change. At this depth we find the commencement of a very heavy disturbance in the measures. The rock showed plainly that very severe lateral pressure had been exerted, and at two points the dip was reversed for a distance of 15 to 30 feet. Between 560 feet and 580 feet depth, the measures were vertical, and at 595 feet they become regular again for a distance of 50 feet. At this point we ran into a shale, in which the rock was so broken up that the dip was lost. This was followed by 25 feet of vertical measures, which came down and rested upon the shale, running at its regular dip at a depth of 702 feet. From this the shale become harder and was very regular, with the dip tending toward the southeast. We then met with a well-defined layer of soft shale roof, resting directly on top of the Ford seam. In No. 2 Shaft the measures were harder, and lying about 45 degees dip. Instead of dipping southeast, as in No. 1 Shaft, the rock swung southwest. The slips were more clearly defined and of sharper throw, and it became apparent that we would meet coal much sooner than in No. 1 Shaft.

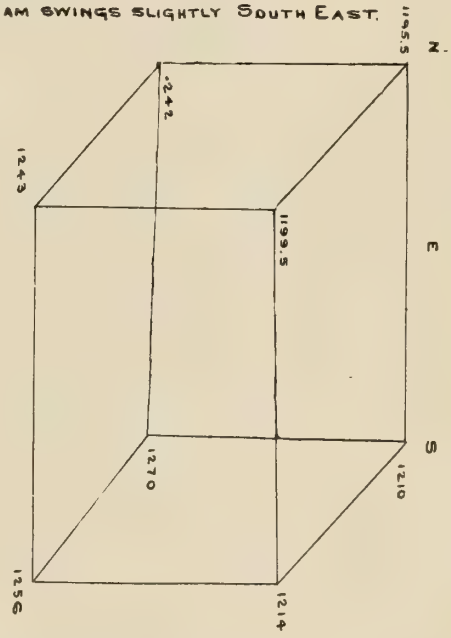
On May 19, 1905, the Ford seam was struck at a depth of 884 feet. The coal entered the northwest corner of the shaft, dipping 50 degrees southeast. The coal was only 6 inches thick on entering, and swelled to 7 feet on the south end. The overlying fault entered on the northwest corner and swung southeast across the shaft, dipping 90 degrees. No water was found with the coal. This is shown by the accompanying cross-section.

Underneath the coal the measures were badly faulted and slipped, and consisted of very tough sandstone, accompanied by several iron bands. As we were not unprepared for this trouble, it was decided to continue sinking to the Cape seam. Deep hitches were placed at the top and bottom of the seam, and work continued. The rock was hard and faulty and difficult to drill; but, on June 27th, coal was again struck at a depth of 977 feet, dipping 45 degrees. This seam showed the same characteristics as the Ford, being pinched to 2 feet in thickness on the north side. A point which greately puzzled us at times, however, was that the coal entered from the northeast side and swung southwest across the shaft; this being opposite from the upper seam, which swung southeast. On the south end of the shaft the coal measured ten feet in thickness, the bottom of the coal in the shaft being 1,005 feet. In order to provide sump room, sinking was continued to a depth of 1,016 feet, which completed No. 2 Shaft on July 17, 1905. Total time occupied in sinking this shaft was fourteen and a half months.

We will now return to Shaft No. 1, which we left at the top of the Ford seam, a depth of 1,195 feet 5 inches. The coal enters from the north side on a dip of 30 degrees, and the bottom of the seam swings southeast. The seam was tapped by the last bench holes on the north end, and it was 16 hours before the drills were again set up, ready to drill the sump. About one foot of coal had been shot out of the north bench; the drills soon reached coal, and the writer can remember some anxious moments, wondering whether we would find nothing but the remnants of the old Ford, as we had in No. 2. The drills fairly raced in the coal, and in one hour they had drilled 12 feet, all in coal. The next round was the same, and for ten days the sinking was carried down in this seam. By that time the anxiety was the other way. At one time as much as 35 feet of untimbered walls of solid coal was standing open to view. The writer believes it safe to say that it was a sight never likely to be seen again. Not a parting band or change of structure in the coal could be found from top to bottom of the seam. Heavy timbers were placed until the rock was reached, when deep hitches were put in. Below the coal there were eight feet of bone and splint, and this rested directly upon the rock. This proved to be dif-

PLAN OF THE FORD SEAM AS STRUCK IN No. 1 SHAFT.

THE COAL ENTERS FROM THE NORTH SIDE AT A DIP OF ABOUT 30 DEGREES AND THE BOTTOM OF THE SEAM SWINGS SLIGHTLY SOUTH EAST.

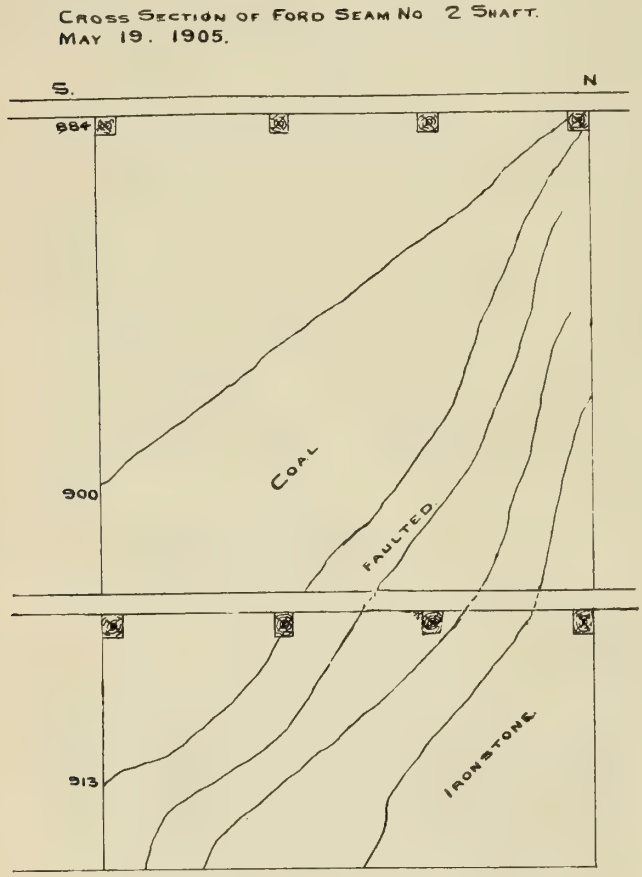


ferent in character than any previously gone through. It was very hard and tough, and had no definite pitch and no limitation, but seemed to split equally in any direction.

The finish was in sight, however, and it is noticeable that greater speed was made than in the softer measures.

On November 22, 1905, at a depth of 1.428 feet, the Cage seam was struck, with the measures practically flat and about on the axis of the basin. First was a well-defined band of ironstone, 1-2 inch thick, then came 3 feet of clay, 4 inches iron-

stone, 4 feet stone coal, and then the main seam of 22 feet of good coal. As the cross-section shows, the coal has a slight dip towards the east; but this turned out to be only a local condition. Work was continued for 50 feet, in order to get sump room. Rock was hard and lying flat.



On December 9, 1905, operations were finished in No. 1 Shaft. The guides in No. 1 compartment had yet to be put on, and this work was finished December 29, 1905, just two years from the first breaking of ground by the Mayors of New Glasgow and Stellarton.

Powder Used in Sinking the Allan Shaft.

Total amount of powder used, 36,950 lbs., 50 per cent. powder.

Total distance sunk, 2,520 feet. An average of powder per foot sunk equal to 14.66 lbs. Average number of holes per round equals 12 holes in sump, 6 holes in each bench; total, 24. The average charge is equal to six sticks 12 inch dynamite per 12 foot hole.

Number of cubic feet of muck per round of powder equals 48 cubic feet. Number of cubic feet of solid per round of powder equals 22 cubic feet. Number of cubic feet of muck per foot sunk equals 726 cubic feet.

Tonnage Raised.

The total amount of muck hoisted is equal to 83,790 tons, which meant 88,200 trips landed on deck, or an average of 211 trips per day of 24 hours. In addition to this, there was hoisted 18,315 tons of water, which is equal to an additional 66 hoists for 24 hours; making an average total hoisted out of the shafts of 277 buckets per day of 24 hours.

This makes a total weight hoisted out of the two shafts, of water and muck, amounting to 101,105 tons.

To mine and hoist this tonnage required 5,730 tons of coal, or one ton of coal is equal to mining and raising 17.64 tons per hour, equals 569 cubic feet.

So far as we have been able to find out, this sinking stands as a record, considering the size of shaft, amount of muck to be handled, and depth of sinking, also the timbering occasioned by heavy loss in the actual sinking time. In No. 1 Shaft 137, and in No. 2 Shaft 100 days were occupied in timbering alone.

In both shafts there were placed 476 sets of timber and 56 sets of hitches. In considering the data on the works by months, and the sinking per 24 hours, this loss of time from special timbering should be taken into account.

Shaft Number One.

Month.	Feet sunk.	Feet Timbered.	Buckets.	Total Depth.	Working Days.
May, 1904	47	47	400	47	21
June	48	26	1,681	95	26
July	72	49	2,907	167	26
August	94	62	2,647	261	27
September	69	128	2,269	330	25
October	85	71	3,373	415	24
November	59	47	2,564	474	25
December	52	75	2,006	526	25
January, 1905	53	54	2,198	579	20
February	72	59	2,625	651	24
March	74	84	2,826	725	27
April	77	64	2,949	802	25
May	68	73	2,720	870	27
June	55	68	2,205	925	23
August	128	100	4,014	1,110	27
September	113	146	3,919	1,223	26
October	126	105	3,966	1,349	26
November	132	137	3,947	1,481	26
December 11th	24	49	836	1,505	8
	1,505	1,503	52,436		475

Average buckets per foot, 34.8.
Average sinking, including timbering per working day, 3.17.

Shaft Number Two.

Month.	Feet sunk.	Feet Timbered.	Buckets.	Total Depth.	Working Days.
May, 1904	62	40	1,102	62	26
June	70	79	2,448	132	26
July	83	62	3,241	215	26
August	102	56	3,390	317	27
September	43	113	1,885	360	25
October	93	82	2,839	453	24
November	70	55	2,604	523	26
December	77	65	2,477	600	26
January, 1905	36	54	1,929	636	19
February	62	73	2,165	698	23
March	86	67	3,098	784	27
April	57	74	2,099	841	21
May	68	83	2,808	909	27
June	84	60	2,914	993	26
Junly 17th	23	53	851	1,016	13
	1,016	1,016	35,850		362

Average buckets per foot, 35.2.
Average sinking, including timbering per working day, 2.81.

Amung the other uses of aluminium may be mentioned spools and bobbins for textile mill work, household and military utensils parts of vibrating and reciprocating machines, equipments for railway cars, oil cups on locomotive driving shafts, pigment and foil to replace silver and tin, letter boxes, lithographic plates alloys, in pyrotechny as a substitute for magnesium, in pattern-making to replace wood, acid carboys, cash checks, bicycle and motor car fittings, chains for hoisting, and jewelry.

Apart from the electrical industry, in which aluminium is gaining favor as a substitute for copper conductors for the transmission of light and power, there has been expansion in other directions. The steel industry is an important consumer of aluminium. Usually from two to five ounces of this metal are employed per ton of open-hearth steel made, and from six to eight ounces for Bessemer steel. The object in adding aluminium in the casting ladle is to reduce the slag or oxide formed while pouring the steel.

Never in the history of the abrasive industry has the time been more opportune for the development of corundum properties than at present.

Black sand obtained from the shallow ravines and gulches is generally the poorest, and when chiefly composed of magnetite and chromite, often practically worthless.

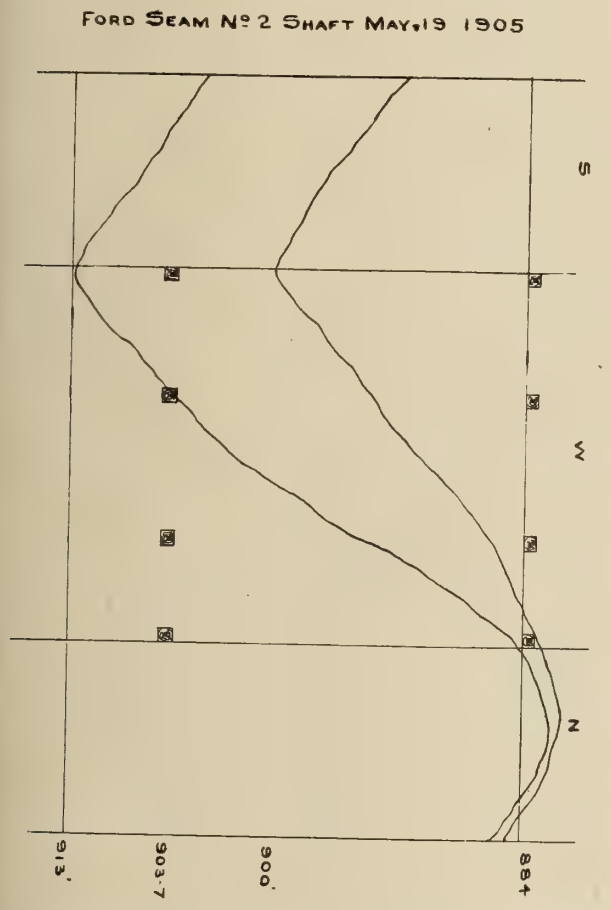
SOME PARADOXES OF MATTE SMELTING

DAVID H. BROWNE, Metallurgist of the Canadian Copper Company.

In working out the problems involved in smelting copper or copper nickel ores, some interesting principles are involved, which, in their practical application, appear to be paradoxes. A study of these shows the importance of looking below the surface of things to find the true relation of the facts involved.

One of the simplest and best-known paradoxes is that a chilled furnace does not alway need more fuel. Take an ore mixture on which the silica is calculated to produce a 33 per cent. silica slag; and suppose 12 per cent. fuel is all that is required to provide heat for the metallurgical reactions.

Suppose now some condition arises, such as a leaky spout, or a delay at the engines, or any minor accident, whereby the blast is cut off for half an hour. On starting the charge may move slowly, and the foreman with good intent may increase the coke, say to 15 per cent. After a few hours the cupola is delivering a wild irony matte low in copper, and a sticky siliceous slag. This slag runs slowly, forms side accretions in the furnace, and narrows



up the smelting zone. In a little while the furnace is delivering very little matte, and the fire has risen to the top of the charge. The furnace is cold below and hot on top. If it could be turned upside down it might shortly recover; but, as it is, the foreman reports it as "badly balled up."

Now what has happened to it? In the first place, there is passing into the cupola fixed amount of air each minute. The pressure of this may vary; but the volume is nearly constant. This air is primarily to oxidize sulphur and iron, secondarily to burn coke. A copper cupola is an oxidizing machine, and exactly reverses the conditions of an iron furnace. The business of the cupola is to send as much sulphur up the stack, and as much iron into the slag as it can economically. Coke has no function, except to produce heat. In fact, if we could furnish heat some other way than by using coke, we would be much better off. The amount of air blown in is always much more than the coke requires; so that the normal atmosphere of the cupola is intensely oxidizing.

Now when the blast stops, the coke in the furnace is still glowing. It absorbs oxygen from the roast ore. It forms CO, and this in turn reduces more of the oxides. The metallic iron formed immediately absorbs sulphur, and the charge gradually changes to a pasty mass of sulphides of iron and copper, and a residue or skeleton of siliceous rock or slag. On starting the furnace we have a lot of high iron matte and a very siliceous slag. The furnace chokes up; the charge cannot pass through, and the action ceases. More coke used at this point simply melts down the sulphide minerals unchanged, increases the silica in the slag, and in general makes a bad matter worse.

What this furnace really needed on starting was, not more fuel, but a few charges of an easily fusible basic mixture, such as couverter slag, or roast ore and limestone, or any material which is easy to meet and is deficient in silica. Such a charge carries the heat down to the hearth, fluxes off the siliceous accretions, and puts the furnace in good condition without any difficulty. Unfortunately, the average foreman at two o'clock in the morning seems to consider no expedient or remedy for a cold furnace except "a little extra coke."

Another paradox is that high silica in the slag often means that the charge needs more instead of less quartz. For example, a cupola is smelting roasted ore and carrying quartz enough to make a 40 per cent. copper matte and a 33 per cent. slica slag. Some poorly roasted ore comes in from the roast yard. The matte shows hot and irony, evidently low in copper, and the slag is siliceous. The foreman gets nervous; waits impatiently for the cent. matte and 36 per cent. slag. He takes off some quartz from next laboratory report, which confirms his fears and shows 30 per the charge, and waits for the furnace to improve. He was wrong. Why?

Here we must consider again the amount of air going into the furnace. This air weighs, say 4 tons to every ton of ore. It is enough under ordinary conditions to oxidize sufficient sulphur and iron to make the proper matte and slag. We strike a lot of high sulphur ore—we need more air, but the blowers are, as a rule, worked to their limit. We cannot blow in more air actually, but we can do so relatively. That is, we can slow the passage of the ore through the furnace, so that each ton of ore is exposed for a longer time than before to the oxidizing blast. This we can do either by decreasing the coke or by increasing the quartz. Either remedy, or both, may be used as local circumstances dictate. The addition of quartz delays the smelting, allows more thorough oxidization of sulphur and iron, and so brings up the grade of the matte, and by burning more iron into the slag actually lowers the percentage of silica in the slag. In this case the remedy is the old one—"a hair of the dog that bit it."

The intelligence of a cupola is at times almost human. A most interesting illustration is the action of a furnace when working pyritically. Here we have no coke to complicate matters. The blast oxidizes iron and sulphur, and the heat thereby generated melts the charge. Suppose such a furnace in proper order making a 40 per cent. silica slag and a 15 per cent. matte, and the amount of quartz in the charge be increased.

The furnace does not produce slag of higher silica content. It simply takes its time to digest this quartz. It burns more iron from the ore, combines this iron with the extra quartz, makes a little better grade of matte for the time, and produces slag of the same silica content as before. Nature can never be forced. All we can do is to find out the conditions under which certain

reactions occur, and, if possible, supply those conditions.

A nice illustration of this parsimony of nature is shown in the selection of siliceous fluxes. The case often happens, where a mine rock consist of natural bisilicates or trisilicates. The ore itself needs silica and we are aiming, for example, to make a mono-silicate slag. The most obvious thing to do would be to smelt these silicate rocks with the ore. On trial, however, it will usually be found cheaper to pick these high silicate minerals out and supply barren quartz in their stead; even where the mine rock carries considerable copper. These high silicate minerals do not readily split up and form new compounds in the cupola. They may meet and dissolve in the slag, but they do not do the desired work. Barren quartz is an active re-agent, while the higher silicate are acid salts which nature has already built up, at much expense of energy, and nature does not like to undo her own work.

Another curious observation in matte smelting is that high sulphur in the charge does not always mean high iron and low copper in the matte. The condition in which this sulphur exists makes a good deal of difference in its action. Thus, a badly roasted ore makes a lower grade matte than a mixture of well roasted ore and unroasted ore, even if this mixture be higher in sulphur. The badly roasted ore consists of a shell of oxides, enclosing a kernel of sulphides. This coating of oxides protects the ore till it gets down to the smelting zone, where it meuts all at once, and the molten sulphides run rapidly down to the hearth. A piece of green ore, surrounded by well roasted ore, is partially roasted in the upper part of the furnace, and when it gets to the smelting zone it has less sulphur than the badly roasted ore. The charge, consisting of a mixture of well roasted and raw ore, remains open and is well acted upon by the blast, where the badly roasted ore escapes action altogether.

These few instances show that in furnace practise we must consider the operation as a whole, and the furnace as an organism containing many parts, each co-related to the other. By the knowledge of underlying principles, we may often discard the evidence of individual analyses and consider a bad slag or low grade matte simply as a symptom of some deeper seated evil.

A matte furnace is not simply a hole surrounded by water jackets. It is a commercial laboratory, in which a great many different and conflicting analyses and syntheses are going on at the same time. The economic conduct of the work depends on our appreciation of this fact and our understanding of the relation of each part to the well-being of the whole.

THE IRONSTONES OF CLEVELAND

By Arthur E. Pratt, Student.

(A paper read before the Institution of Mining and Metallurgy, London, Eng., April 18th, 1907.)

Geology and Mining.—The Cleveland ironstone occurs in large beds in the Middle Lias formation of the North Riding of Yorkshire. The whole of the Middle Lias is more or less ferruginous, but the upper portion is the most productive. The beds cover a total area of about 350 square miles, but cannot be worked profitably for much more than one-fifth of that area. The beds worked extend inland from Redcar through Upleatham and Eston to Normandy, at which places the seam is thickest and best. To the northwest the bed thins rapidly, but to the southeast it thins very gradually, and dips gently about 1 in 15 in this direction. As the bed extends towards the southeast it becomes parted by bands of shale and pyrites. There is no shale band at Brotton, although there is a difference of color in the middle of the seam, but the stone is not affected in quality by it. The shale, however, appears in Kilton, to the south of Brotton, and Loftus, to the east, and develops to such an extent in the southwesterly direction that is 31 feet thick in the valley of the Esk. Where best developed the bed has a total thickness of more than 20 feet.

The upper seam is generally too silicous to be worth working, and practically the whole of the ore is obtained from the middle or main seam. The top seam of ironstone really belongs to the oolite and immediately underlies the freestone, coming between it and the alum shale of the Upper Lias. It was worked for several years at Port Mulgrave and elsewhere, and is still worked at Rosedale.

The average thickness of the main seam is about 10 feet at the northern part—in the neighborhood of Saltburn. Eastward from Saltburn it crops out at Gluntcliff about 300 feet above sea level, and can be traced along the cliffs overlooking the sea in many places, at Loftus, Boulby, and as far as Staithes. At Port Mulgrave it is about 70 feet below sea level. Inland the seam dips and the cover increases, the deepest pit being about 128 fathoms.

The ore is impure clay ironstone, consisting of carbonate of iron with clay, and calcium and magnesium carbonates, also containing about 1.5 per cent to 1.7 per cent. of phosphoric anhydride, or 0.65 per cent. to 0.74 per cent. of phosphorus.

In color the stone is either a greenish grey, such stone having an oolitic structure, or else bluish-grey, in which case it resembles a mudstone and is not oolitic. The characteristic color of the Cleveland stone is said to be due to the presence of silicate of iron. Some varieties are also red owing to the presence of ferric acid. Fossils are entirely absent from some of the stone, but other varieties are highly fossiliferous. The fossiliferous stone is frequently of a red color. The best fossils were obtained at Eston Mine, near the outcrop, but not where the stone was red.

As raised from the mine the ores contain 20 to 33 per cent. iron, the percentage falling towards the southeast (at Whitby it is only 25 per cent.), while the proportion of sulphur and shale in the lump ore increases.

The term "dogger" is applied both to the seams of shale containing ferruginous nodules and to the nodules themselves. In some places it forms a valuable ore, containing up to 50 per cent. iron. It is magnetic and exhibits polarity, has a greenish-blue or black color and an imperfect oolitic structure.

With regard to the origin of these beds, it is probable that some of the iron carbonate was deposited mechanically, while the greater part was formed chemically by replacement of a bed of limestone.

The Cleveland beds produce 40 per cent. of all the iron ore raised in this country, the average yield per acre being 20,000 to 50,000 tons. In 1903 the output was over 5 1-2 million tons; in 1906, 6,100,000 tons. At the present rate of consumption the best deposits are expected to last for about 50 years.

The ore is mined by a system of pillar-working with temporary pillars. Details and dimensions vary somewhat in different mines, but the following may be taken as a typical example.*

*See "Ore and Stone Mining," Sir C. Le Neve Foster and Bennet H. Brough, p. 334.

From the bottom of one of the shafts a "mainway" 5 yards wide is driven out level, or with only a slight incline. At intervals of 20 yards, drivages, also 5 yards wide, are put out at right angles to the mainway. These are known as "bords." At intervals of 30 yards along the bords, cross drivages are made, which are only 4 yards wide, and are known as "walls." Thus the bed is cut up into a series of pillars 30 yards by 20, while a considerable amount of ore has been removed in making the galleries. The pillars are now attacked, beginning with those near

the boundary and working towards the shaft. A "drift" of 2 to 4 yards in width is worked across the pillar from the bord, cutting off one-third.

From the drift this rectangular portion is removed by drivages, known as "lifts," either two or three in number. While these lifts are being worked away, another drift is driven across the remaining two-thirds of the pillar in preparation for another set of lifts. Sometimes a corner or portion of the side of a pillar is left standing during working to keep out the fallen rubbish beyond, or prevent a too sudden fall of roof. During removal of the ironstone the working place is timbered, but this is subsequently taken away and the roof allowed to fall in.

A very good example of a Cleveland ironstone mine is afforded by the Lumpsey Mine, near Brotton, the average output of which is 11,000 to 12,000 tons per week. The ore from here contains about 29 per cent. iron in the raw and 37 per cent. calcined, and is not of very good quality, but the mine has several interesting features which are worthy of notice.

The shaft is 96 fathoms in depth, and the strata passed through in putting it down were first beds of sandstone and shale, then alum shale, then jet shale, then grey shale with dogger, and finally ironstone. From the top of the alum shale to the bottom of the ironstone is about 240 feet. The main seam at Lumpsey is about 50 fathoms below sea level, and is 9 feet 6 inches thick. All the power used in the mine is electrical, with the exception of that required for winding, which is done by steam. There are three Lancashire boilers (one always acting as a stand-by), with Green's economizer for pre-heating the feed water The pressure of steam is 120 to 150 lbs. per square inch. In the engine house there are two separate engines, high and low pressure respectively, the low pressure engine taking the exhaust steam from the high pressure, and each engine being cranked to one end of th drum shaft.

A pleasing feature underground is the general cleanliness and freedom from water, and also the roomy levels, which one would expect from the nature of the seam.

1. *Gravity Inclines* used in one of the main levels where the stone has to be brought down hill. A rope passes round a pulley at the top of the incline. The full trucks are attached at the top, and by their weight pull up the empty ones from the bottom, the speed being regulated by a brake on the pulley. The line of rails is only double in the middle where the trucks pass one another. These self-acting inclines are worked with one rope, which runs backwards and forwards, and the end that lowers full tubs in one run brings up empties the next, and so on.

2. *Electrical Endless-rope Haulage.*—The outbye pulley (which is a clip pulley) is worked by a motor. The full tubs are pulled up on one line of rails, whilst the empties travel in on another, the rope passing round another pulley, the inbye pulley, at the far end. This is used in one of the main levels 1 1-4 miles long, and double track the whole length.

3. *Horse Haulage* is employed for conveying the stone from the working parts to the main levels. There are large stables underground, with stalls for 45 horses at one end of the mine and 30 at the other end.

4. *Electrical Direct Haulage.*—This is used in one of the levels at the dip side, which has a very steep gradient. The motor drives a drum through belt gearing, and on the drum is wound a single rope, by which full trucks are pulled up and then the empty ones let down. The motor is a direct current Westinghouse machine, 200 to 400 amperes, 220 volts, 200 horse-power, speed on full load 550 revolutions. The rails underground are provided at intervals with rotating axle-greasers for the trucks.

For drilling, both rotary, hand and electrical drills are employed. For blasting, gelignite and similar explosives were found to be unsuitable in action, pulverizing the stone without bringing it down, so compressed pellets of black powder, weighing about 2 ounces each, are used. Blasting gives about 2 tons per hole, and costs 1 1-2d. per ton of ore.

Underground surveying is done with the theodolite, as the miner's compass is affected by the doggers.

At the shaft head, the methods of dealing with the ore as it is wound are extremely up-to-date and almost entirely automatic. A full truck, on arriving at the pit head, is pushed out by a man on to an incline, down which it passes to a tippler. There the truck is emptied of its ore, which falls down a grizzley into a railway truck beneath—a branch of the Northeastern Line passes quite close to the mine; in fact, one walks along the rails from Brotton Station to the mine.

On leaving the tippler, the empty truck continues down an incline, and, passing automatic points, reaches a siding which is inclined upwards. At the end of the siding is a powerful spring, which serves to send the truck back again down the siding and past the automatic points. The truck now travels in the reverse direction and parallel to the way along which it came. After passing the points, the truck continues down a short incline until it meets a creep chain which takes it up on to a level, at the end of which it meets a stop. Three or four trucks may remain on this level until required.

On releasing the stop, the truck passes down an incline, past automatic points and past a catch, and travels some way up a second incline . On losing its momentum, it returns and is stopped by the catch, where it waits until required. The automatic points last mentioned are on the opposite side of the pit head to those previously mentioned, so that the truck is now going in the same direction as when it started and is returning to the cage. On releasing the catch, the truck passes down an incline and past points which are arranged to send it to the compartment of the shaft where the empty cage awaits it. The tippler has cog-wheels instead of friction wheels for turning, on account of the heavy weights, and it takes one truck at a time.

As the full truck (or "tub" as it is called locally) pushes the empty one out, the latter catches a lever which puts the tippler into gear. The tippler makes a revolution, and, in coming back to its place, puts itself out of gear again, while the truck just emptied remains in, ready to be pushed out by the next full one. The tippler is capable of dealing with 300 tons per hour.

The only manual labor required with this arrangement, beyond that involved in pulling levers to release catches, etc., is that of pushing the trucks out of the cage to start them on their journey.

Calcination.—Although gas-fired calciners using blast furnace gas are now being introduced, still by far the greater proportion of Cleveland ironstone is calcined in the Gjers or Cleveland kiln, or in modifications thereof. It is a matter of regret that drawings of some modern form of Cleveland kiln have not yet found their way into metallurgical text-books. The old form, discharging on to the ground, continues to be reproduced, together with the earliest type of Whitwell stove, as representative of British ironworks practice. Kilns of this description may still be seen in some of the older works. In one case, not only this early type of kiln, but also U-pipe stoves are to be seen, although it should be added that the works in question have the reputation of turning out some of the best pig iron in Cleveland.

The forms of kiln and the method of work at the Clarence Ironworks, Middlesbro', may be taken as typical examples of modern practice. In this works there are two distinct sets of blast furnaces, kilns, engine houses, etc., known respectively as the Old and New Sides.

On the Old Side the kilns are 16 in number, 15 of them being 37 feet high x 21 feet diameter, inside the lining, which is 18 inches thick. There is also one oval kiln 35 feet high x 35 feet, and 22 feet 6 inches diameter, lining 18 inches thick.

The round kilns have a capacity of 7,600 cubic feet. The gantry on the Old Side is supported by the outside shells of the kilns. The New Side kilns are higher. They are 14 in number, 12 being 21 feet diameter inside the lining (18 inches thick), and 44 feet high, and having a capacity of 10,400 cubic feet. One kiln is 19 feet 9 inches diameter inside the 18 inch lining x 43 feet 3 inches high, with 8,600 cubic feet capacity. This kiln is

drawn at one side only. There is also a rectangular kiln 20 feet 8 inches x 16 feet 10 1-2 inches x 44 feet, 18 inch lining, capacity 10,459 cubic feet.

The New Side kilns have the gantry supported by iron girder work, thus avoiding any strain on the kilns themselves. The burnt stone is drawn through 6 "eyes," or shoots, the lower ends of which are 3 feet 9 inches and 4 feet 6 inches above the ground level for the Old and New Sides respectively.

The cone in the Old Side kilns makes an angle of 55 degrees with the vertical centre line of the kiln.

On the New Side the cone is steeper, making an angle of 45 degrees, except in the case of 2 kilns which were altered to the old angle.

The varieties of ore calcined at the Clarence Works are obtained from the following mines, all owned by Messrs. Bell Bros.:

1. *Huntcliff.*—This ore contains much Fe_2O_3, which gives it its red color. It is also highly fossiliferous.

2. *Park Pit.*—Has the characteristic color of Cleveland ironstone, but is reddish in some parts. It contains much sulphur, both disseminated through the ore and occurring in black bands.

3. *Skeleton.*—Resembles Park Pit, but is somewhat paler. It contains sulphur and also considerable quantities of an oily shale, and weathers when exposed, the shale and sulphur bands breaking up and leaving the ironstone intact. Appreciably less fuel is required in the kiln when Lumpsey stone is calcined, owing to the oil which is present.

The coal used for calcination is obtained from pits in the neighborhood of Durham. After calcination the ore has lost 25—30 per cent. of its weight, and becomes a brick-red color owing to formation of Fe_2O_3. It is also softer.

The ore reaches the works in trains of 30 or more trucks, which are left on the sidings at the end of the gantry until required for tipping. The trucks used are hopper trucks known as "stripes," and hold 10 to 11 tons of ore.

The mode of working a shift at the kilns is as follows:—In the morning at six o'clock the kiln is about "six trucks down" (*i.e.*, it takes six trucks of stone to fill it), since it has been drawn continuously during the greater part of the night but not charged. The fire is well visible and should extend round the circumference and across the centre. The kilns are first coaled where required, the coaler only putting a shovel or two of coal in those places where the stone is "dead" or not fired properly.

Then four trucks of stone are tipped into each kiln, and the kilns again coaled, a thin layer of coal being shovelled all over the surface of the stone, just enough to cover it. Then two more trucks are tipped in each kiln and the kilns again coaled, more coal being put in those places that require it. This finishes the morning shift, and the evening shift is worked in a similar way. The shifts are from 6 a.m. to 2 p.m., or longer, for the morning, and from 4 p.m. to 12 midnight for the evening. The morning shift entails a greater amount of work, owing to the long interval between midnight and six o'clock, during which no charging has been done.

With regard to details of tipping the ore, the engine brings a small train of half a dozen or more trucks to the top end of the gantry and leaves them there. Owing to the incline of the gantry and the hand brakes on the trucks, the men can move the trucks and stop them over any kiln. In the bottom of the trucks are four drop doors held up by catches kept in place by pins.

When tipping, the pressure on the pins is released by a special iron implement and the pin withdrawn. Then the catch is forced back, and the ore drops through the doors into the kiln. More or less ore always remains in the ends of the truck, and this is dragged down by means of iron "hooks."

When the truck is cleared the drop doors are lifted up from the inside by inserting the end of the hook in a small hole, while a man outside replaces the pins. By releasing the brakes and removing the chock of wood from under the wheel, the truck is then readily pushed down the incline to make way for the next full one. Occasionally a truck of fine ore, known as "small stone," comes along for tipping. In this case half a truck is tipped into each kiln, two of the doors only being dropped.

In coaling, trucks of coal come on to the gantry only during the second coaling, *i.e.*, after tipping four trucks of stone into each kiln. Coal is then shovelled into the kilns by men standing in the trucks. The coal is in the form of slack. The men also make small heaps of coal on each side of the kiln and between the two sets of rails in the middle. It is from these heaps that the first and last coaling in the shift is done, the greater part of the coal consumed being shovelled on from the trucks during the middle coaling.

In drawing the kilns, two barrow loads at a time are drawn from each of the six eyes in rotation. Some of the kilns are oval or rectangular in plan, having three eyes together on each side. These are drawn in the same way, but the men prefer the round form to the oval for two reasons, viz.: They claim (1) that the round kilns work more regularly and use less coal, and (2) that they are easier to draw, as the eyes project and are not in a sort of recess. This enables the men to wheel their barrows straight up to them, and straight away again with a minimum amount of exertion.

The supply of ore and check on amount tipped are arranged for as follows: The gantry foreman sends an order each day for the ore he thinks he will require for his next shift to the office in Middlesbro,' whence it goes to the mines. At the mines the full trucks are weighed and the actual weight of ore is entered up in the invoice opposite the number of the truck. Each truck has spaces in which small cards can be slipped. These cards are printed with the number of the truck, the name of the mine, the name of Bell Bros., Clarence Works, etc., and space is provided for entering the weight of ore in the truck. The numbers are entered up in a book, so that the exact weight of ore tipped per shift is obtained. The same system is adopted for the coal.

With regard to the quantity of coal required for calcination, the amount given in text-books is usually 1 ton of coal for 20 to 25 tons of ore. The amount actually used in these works is 0.70 cwt. per ton of raw stone, or about 2 cwt. per ton of pig iron, which works out to 1 ton of coal for 21 to 29 tons of ore. This excellent result is possibly partly due to the oil shale which some of the ore contains, but may also be taken to be very largely due to good management of the kilns. It may be of interest to give a few brief notes on this subject.

1. *Practical Notes on Working the Cleveland Kiln.*—The stone should burn round the circumference and across the centre. As the stone is tipped into the middle of each semi-circle (looking at a plan of the kiln), this ensures that the burning takes place from outwards towards the centre. The fire may be kept in its proper place by judicious coaling.

2. The kiln should be drawn from each eye in rotation. If the men have not a smart foreman they will often draw continuously from the eye nearest the furnace hoist. This causes the fire to be drawn over to that side and is very liable to cause a scar, and also to cause "green" or unburned stone to come through the other eyes when they are drawn. One can see when the men have been drawing from one side only by noticing the line of fire, which should be across the centre of the kiln, is all on one side.

3. Too much small stone stops the draught and tends to cause scars. It is advisable that not much more than half a truck be tipped in each kiln per shift.

4. Scars are large masses of ore which have become fused together owing to excess of heat and are too large to be drawn through the eyes. They have to be broken up by prodding them with iron bars through the eyes. Large scars may give much trouble, first by sticking to the side and causing an irregular descent of material, with liability of green stone coming through, and, second, by stopping the working of the kiln altogether, in which case the fire has to be let out and the scar broken up from the inside. The chief causes of scars are (1) excessive or injudicious coaling, (2) irregular burning, caused by drawing from

ne side only, or stoppage of draft by too much small stone, or ly the presence of a small scar on the side wall. The effect of regular burning is that green or unburned stone, together with s unburned coal, makes its way down one side of the kiln, and n reaching the bottom is fired from the other side, which is urning normally. This causes a sudden local increase of temerature, producing a scar.

5. In coaling the kilns, the "dirty" side (that towards which he wind is blowing) should be coaled first, so as to avoid the moke and fumes when coaling the other side.

6. A new-lined kiln takes appreciably less coal than one with any cavities in the lining.

7. The kilns should be drawn regularly and with fair frequency. This ensures the fire being well down towards the bottom and of a good depth. When the kiln is drawn at long intervals, the fire works its way upwards, getting very shallow and leaving a great depth of burnt stone below it. When this stone is drawn, the fire generally goes out or becomes improperly distributed.

8. More coal is required for the kilns in winter than in summer, on account of the moisture. The average amount works out at 12 tons extra per day per 24 kilns.

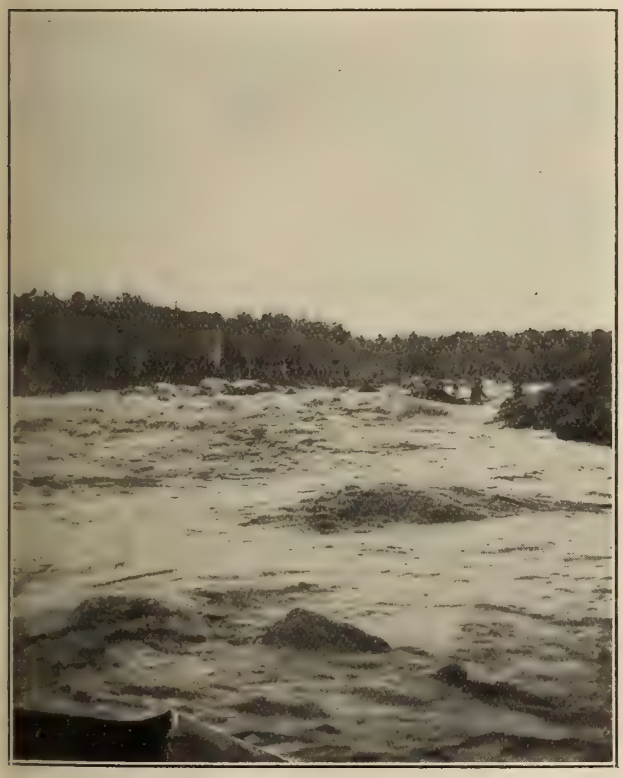
In conclusion, the author desires to express his appreciation of the ample facilities afforded by Messrs. Bell Bros., both to himself and other students of the Royal School of Mines, for obtaining at the Clarence Works a first-hand practical knowledge of blast furnace work. He is also greatly indebted to Mr. Greville Jones, of the Clarence Works, and Mr. D. W. Dixon, of the Lumpsey Mines, for their kindness in revising the proofs of this paper.

PROSPECTING IN UNGAVA

By J. C. Murray.

In the following article very free use has been made of Mr. A. P. Low's reports on the geology of the districts mentioned.

On June 1st, 1901, a party of nine white men and about twenty Indians embarked from Missanabie (a station on the C. P. R. 556 miles west of Ottawa) and started down the lake and river route for Moose Factory, Hudson Bay. On June 17th Moose Factory was reached. The journey had been somewhat trying. The writer was one of the crew of a large rowboat (18 feet over all),



RAPIDS ON MOOSE RIVER

which had to be handled over portage and rapid and river for the long three hundred miles separating Moose Factory from Missanabie. Low water, piratical mosquitoes, malignant black flies, and lazy Indians, all did their best to contribute to our discomfort.

At Moose Factory the Indians were discharged. Four of the nine white men, headed by Mr. D. B. Dowling, of the Geological Survey of Canada, sailed up the west coast of James Bay for a summer's exploration. The remaining five, under the command of Mr. A. P. Low, who had been engaged by a private company to examine and locate mineral claims upon the Nastapoka Islands, left Moose Factory on the yawl-rigged 35-foot sailing yacht "Alle," on Monday, 24th June.

Touching at Charlton and Cape Hope Islands, we made Paint Hills Islands on June 29th. Heavy fog and a thunderstorm gave us a rather difficult run. Ice was encountered several times, and caused us much trouble. On Paint Hills Island a large deposit



NASTAPOKA FALLS

of iron pyrites was examined and staked out. Here also an Indian pilot was picked up, to guide us through the treacherous shoals lying between Paint Hills Bay and Fort George H. B. Post at the mouth of Big River. We made Fort George on July 2nd, in a full gale. The Fort is a consistent Hudson Bay Post, quaintly picturesque, with its stockades and Indian encampments grouped about the Factor's House. It is situated on an island at the mouth of Big River. It is of interest as marking the northerly

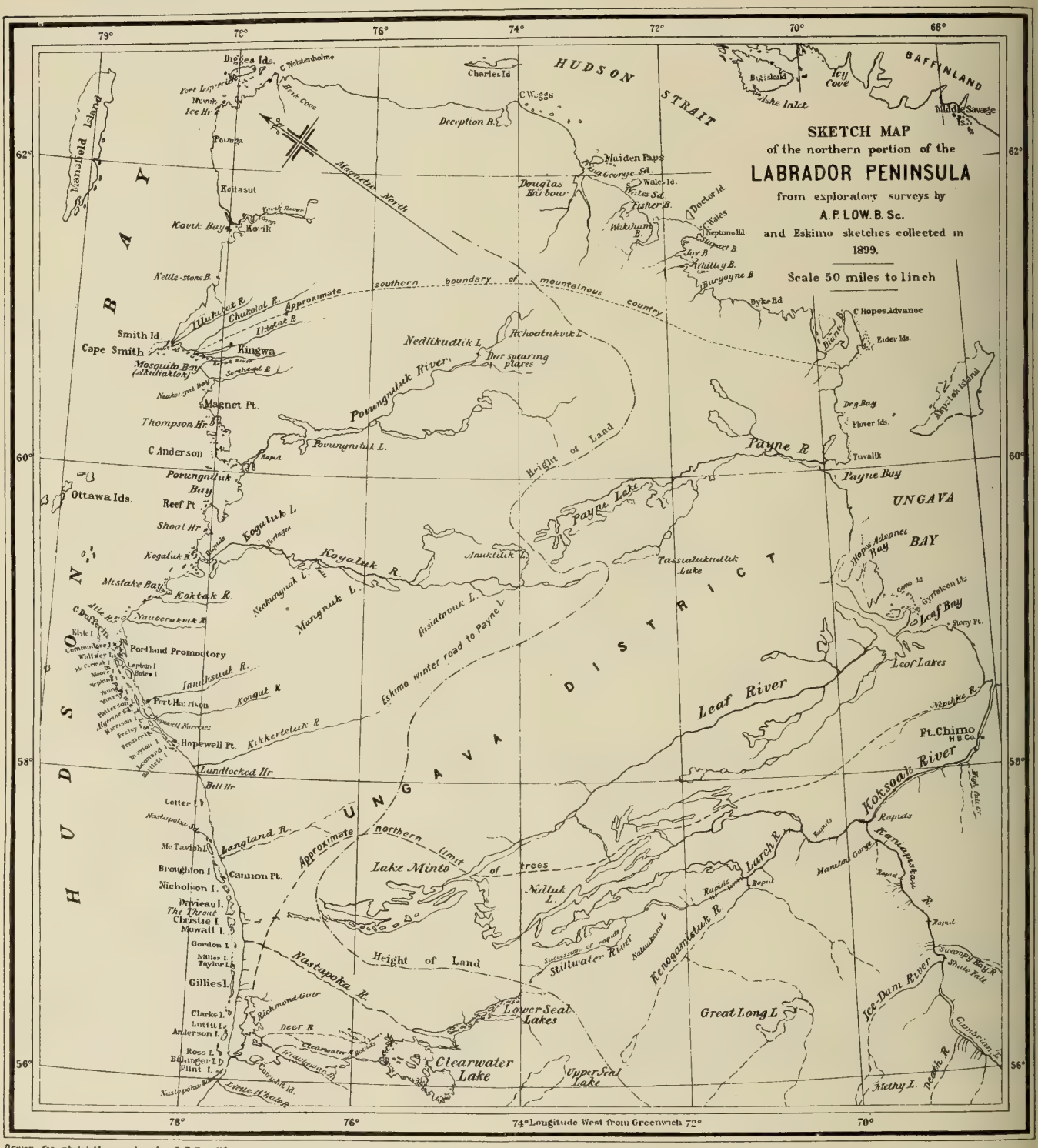
limit of land cultivation on the east coast of Hudson Bay. Potatoes and other vegetables are successfully grown here, and the Factor possesses a herd of cattle.

Cape Jones, the northern limit of the east shore of James Bay, loomed in sight on July 7th, and here we engaged three Eskimos, two of whom brought their families along with them. It was arranged that they should follow us in a sailing boat that had been chartered at Fort George.

Long Island was touched on July 9th. The Island is from one to three miles wide and about twenty-three miles long, and is distant from the mainland not more than five miles.

Low cliffs of limestone mark the east side. This Cambrian limestone, overlain by ferriginous cherty beds, which are in turn capped with trap, constitute most of the island. Much iron carbonate was observed here.

With a favorable breeze we logged 57 knots on July 9th, and reached Great Whale River, where is the most northerly Hudson Bay Post on this shore. A striking change was observable in the appearance of the country in this run. Low, rounded hills of gneiss and granite can be seen a short distance inland. The shore itself is generally low and sandy, and rises in terraces to the granite hills.



REPRODUCED FROM GEOLOGICAL SURVEY OF CANADA

Leaving Great Whale on July 11th, Little Whale River was reached during the evening of the same day. Thirty miles of this distance was made in Manitounuk Sound, between Manitounuk Islands and the mainland. Then, striking through a narrow channel between the islands, the remaining miles were run in the open.

Unaltered Cambrian sedimentary rocks, capped with diabase, form the coast from the northern extremity of Manitounuk



CLIFFS OF LIMESTONE AND SANDSTONE ON COTTER ISLAND

Sound northward to Little Whale River. This formation passes south into the Manitounuk Islands.

At Little Whale we found the ruins of an old Company Post. There are two well-defined trap overflows superimposed upon the sedimentary rocks here. The weathering of the under strata of sandstone and limestone has caused the fall of huge pieces of the basaltic trap. Galena, in small pockets, occurs throughout the limestone.

After a day's cruise, stress of weather and the loss of an anchor forced us into the entrance of Richmond Gulf. Almost exactly at this point the small scrub pines disappeared from the coast line, and beyond this no trees whatever were observed.

Iron ore occurs on the southern side of Richmond Gulf and continues north to the Nastapoka Islands.

We had now arrived at our real objective point, and systematic work was at once begun.

Commencing near the mouth of Little Whale River, the Nastapoka Islands extend northward for one hundred and twenty miles. They lie from one to three miles out from the mainland, and, with the exception of the most northerly, Cotter Island, are very close together.

The shoreward faces of the islands are precipitous cliffs, 100 to 350 feet in height, sloping with a dip of from 15 degrees to 35 degrees westward into the sea. Their general appearance roughly suggests an emergence of the edge of the basin which forms the bottom of Hudson Bay. The east shores afford safe anchorages for craft of all sizes; but on the mainland only at the mouths of Nastapoka and Langland Rivers can harbours be found.

The Islands are marked from summit to sea level with old terraces and beaches, evidences of profound uplifting towards the close of the glacial period.

In general, the Nastapoka Islands give a section in descending order, of the follow members:—

1. Rusty weathering, dark gray, siliceous rock containing ankerite and magnetite—20 to 100 feet.
2. Dark gray siliceous rock, containing magnetite with small quantities of ankerite—50 to 250 feet.
3. Red jaspilyte, rich in hematite ore—10 to 100 feet.
4. Red jaspilyte, poor in hematite ore—5 to 20 feet.
5. Purple, or greenish weathering, dark green, graywacké shales—10 to 70 feet.
6. Red jaspilyte, poor in hematite ore—5 feet.
7. Light greenish gray sandstone and shale—10 to 300 feet.
8. Fine grained dolomite—50 feet.

The rocks of the first division are found on all the islands except Cotter, the most northerly. These occur in thin beds, the partings being filled with brownish ankerite, which also occurs in flat lenticular masses enclosed in the cherts. These measures are traceable 150 miles south to Long Island.

The typical rock of the second measure is a dark gray, fine-grained variety of quartzite chert, containing considerable magnetite scattered through it in minute crystals, and small quantities of siderite and ankerite. The mixture of silica and magnetite in the ore is intimate, the silica being usually in a finely divided state. The proportions of rock vary. In some places a lean ferruginous chert is found, and in others a rich sixty per cent. iron ore. In the lower beds, large quantities of the richer ores are found. Similar occurrences in the Lake Superior region have been prescribed by Prof. Van Hise.

On the three southern islands, these measures gradually pass into a brownish-black siliceous shale, rich in iron, and containing considerable carbon and small flakes of graphite.

The typical rock of the third division is fine-grained and very siliceous, with minute particles of silica coated with red oxide of iron, forming a coarse, impure red jasper.

These jasper rocks usually occur in thin broken bands, with the partings between them filled with a finely-divided mixture of hematite, magnetite and jasper. The hematite is greatly in excess of the magnetite. The intimate association of the iron ores and the jasper points to their simultaneous deposition from aqueous solutions, probably leached from the cherty carbonate measures above. Where the ore is poor, the jaspery rock predominates and incloses lenses of hematite, while where the hematite is most plentiful it incloses similar lenses of jasper.

The fourth division, consisting of red jsapilytes, is an arbitrary one, of use only as a sub-division of the iron-bearing rocks.

The rocks of the fifth division differ from those of the rest of the section in that they are of volcanic origin.



GILLIES ISLAND—UPPER IRON BEDS

The dolomites forming the eighth and lowest division are only met with at the eastern point of Belanger Island, the last but one to the extreme south.

From a study made of the southern cliffs of Richmond Gulf, in 1988, by Mr. Low, it is inferred that the Nastapoka group of rocks, with their important iron-bearing measures, belong to the middle portion of the so-called Cambrian formation of the Peninsula of Labrador. Consequently, they are older than the rocks of the coast and underlie them.

Large areas of similar unaltered sedimentary rocks occur throughout the Peninsula of Labrador, and are probably the

equivalents of certain of the iron-bearing series about Lake Superior and of those to the westward of Hudson Bay.

The southerly islands of the Nastapoka group are richer in iron ore than those towards the north. In Gillies Island (see map), the iron-bearing measures constitute at least four-fifths of its rock areas. At Taylor Island the iron-bearing rocks attain a maximum thickness of nearly 200 feet.

Towards the northern end of Davieau Island the dark gray cherts become thicker, especially in the upper rusty portion carrying ankerite, while the underlying jaspilyte contains less hematite and gradually thins out. The total amount of ore appears to be smaller and to be more evenly disseminated than in the southerly island, so that no part is rich enough for mining.

On the mainland, almost opposite Gordon Island, are the Falls of Nastapoka River. From a photograph only a very meagre idea can be obtained of their splendor. A high perpendicular wall of rock on the north side, and broken, massy crags on the other, form the banks of the river. At the falls the river leaps



WEATHERING EFFECT, NASTAPOKA ISLANDS

splendidly out and drops a sheer 100 feet. The water is shaken into the whitest foam ,but, as a contrast, pure deep green bands of unbroken water are visible behind the white of the foam. The stream then drops farther, down a constricted channel of solid rock, to tide-water. In all, there is a drop of about 170 feet. Almost incalculable power has been wasting itself here for ages.

Langland River, also, has not inconsiderable falls near its mouth. They are not, however, at all to be compared with Nastapoka. At both places, and at Nastapoka particularly, an enormous aggregate of industrial power could be developed.

There is little doubt that in due course of time, when concentrating and smelting methods shall have been improved, the iron deposits on many of these islands will be amenable to reduction upon a commercial scale.

(To be continued.)

Muscovite, the most common of the micas, is named from Muscovy, a part of Eastern Russia. The occurrence of this mica is confined, more or less, to pegmatite dikes, masses, lenses, sheets or veins, which in chaarcter may be called a very coarse granite.

COAL SAMPLING

(Paper read by Dr. J. E. Woodman before the Nova Scotia Mining Society.)

Recent plans of the Director of the Geological Survey of Canada lend especial interest to discussion upon two subjects—namely, the classification of coals and the relative efficiency of various methods of sampling coal.

A few years ago the United States Geological Survey began to carry out a plan for testing coal on small and large scales, and in every way which might be useful for the consumer and the investor. For this purpose they erected at St. Louis, Missouri, a testing plant in which these results might be reached; and, although the plant has been in operation but a short time, certain data have been gathered which give a fair indication of certain qualities to which we have been paying a little attention.

It is understood that Mr. A. P. Low, Director of the Geological Survey of Canada, is planning for a similar series of test investigations in connection with the Laboratories of McGill University. It is intended that the sampling of the coal shall be done by specially designated members of the Survey staff, who will cover the various collieries from the Eastern to the Western extremities of the continent. In addition to the ordinary chemical laboratory analyses and tests, it is intended to subject the coals to practical tests under boilers, and in every other way which will give valuable information regarding all of their fuel properties. The results will be printed in leaflet form as fast as obtained, and distributed quickly to those most interested in that particular coal. These will later be collected into pamphlets, and probably at the end a larger monograph will result. It is important to note that not only is a new departure being made in the type of work done by the Survey, but also in the rapidity with which the results bid fair to reach the public. The distribution of the summary report for 1906 within less than a month after the close of the year is an earnest of what is to come later.

It is an important question, under what conditions coal sampling can be done so as to give results most directly applicable for commercial purposes. I take it for granted that the chief value of sampling and analysing any economic raw material is the discovery of its commercial properties. For surely no merely academic interest would be responsible for the large amount of analytical work that has been done upon various substances. The sources of the material in coal sampling may be quite varied. In the first place, on may sample the coal in process of shipment, secondly, one may sample the coal at point of delivery, or thirdly, the coal may be sampled at the point of consumption, which is nearly the same. As contrasted with these localities, there are the mines and their surroundings. Should the coal be sampled underground, in the seam, or on the rakes or lifts at the bank head, or periodically at the storage piles; or should all of these localities be used in order to check one another? For metallurgical purposes, it seems clear that whatever sampling is done at the mine, there should be careful sampling at the point of discharge of the coal; since it is probable that only a part of the coal mined at any particular colliery will reach a certain metallurgical establishment, and, moreover, it is perfectly conceivable that the coal which is used at such establishment may not always have the same source. Thus we have the two facts to consider, namely, variability in the mine and variability of source of shipment. The present paper aims only to show the results of work done in connection with the United States Geological Survey testing plants at St. Louis, in order to see whether we may get some light upon possible methods to be used later in this country. It makes no claim to originality in any way, being essentially a resume of what has been published on the subject by the United States Geological Survey, and in the Am. Inst. Min., Eng.

In the St. Louis plant, coal was received for testing only in car load lots, and the cars were loaded under the immediate supervision of a member of the Government. As a check upon these results, two mine samples were collected from each colliery;

and these samples, as well as samples taken from each car when received at the testing plant, were analyzed in the chemical laboratory. The dominant idea throughout was that the mine sampling should be so done that the coal should have the same composition as the commercial output of the mine. Before sampling, the mine was examined, and all its peculiarities, or rather the peculiarities of the seam and surrounding rocks, carefully noted. Methods of mining were observed, and note was taken of whatever efforts were made commercially in the mine or at the bank head to free the coal from impurities. Two points were then selected for sampling in widely different parts of the mine, but always in parts then in process of excavation and shipment. After cleaning the floor, an oilcloth blanket was spread to catch the coal, to prevent it from being mixed with dirt, and to avoid absorption of moisture where the floor was wet. A cut was made clear across the face of the coal, about three inches wide and one inch deep. The material from this cut would include the thin partings of shale, clay, or sulphur, such as the loaders would not separate from the coal; but would not include anything that is usually thrown out by the miners. Such a sample, weighing 25 or 30 pounds, was placed in a sack and taken to the Survey, there to be pulverized and quartered. The final result would be about one quart of fine coal. This was placed in a screw top iron sampling case, the cover of which was bound with electric tape. These were mailed directly from the colliery to the laboratory, and the sample was then transferred to a glass jar and sealed.

After securing the sample underground, the inspector went to the surface to observe the loading of a test car. In this loading, such hand picking was allowed as was usually done in preparing coal for the market, and every care was taken to make the car a representative commercial sample. In the case of very soft coals and lignites, such as we have in abundance in our Western Provinces, box cars were used for transportation, in order to keep the coal from disintegrating in transit. Ordinarily, however, the bituminous as well as the anthracite coal was shipped in the usual open cars. As far as possible the shipping was done during the pleasanter seasons of the year. Thus all possible ordinary precautions have been taken to prevent a great change in the moisture contents of the coal between the pit bottom and the testing plant.

Upon arrival, the coal was unloaded and passed at once through rolls which had apertures of 1.5 inches. As the coal was fed to the rolls, samples were taken at regular intervals with a small shovel. Thus a practically continuous sample aggregating 200 or 300 pounds would be obtained from each car. This was taken directly to the chemical laboratory and analyzed. In the laboratory all samples were divided, and part stored in sealed glass jars for future reference. The remainder was subjected to practical analysis. The sample was air dried until it reached a practically constant weight and the loss of moisture was determined. The sample was then analyzed, and its composition was recalculated on the basis of the coal as it was originally received. The two mine samples were always averaged; and the percentages of moisture, sulphur and ash are considered as representing practically the impurities obtained in as careful mine sampling as could be devised. The car samples were also averaged; and the result is regarded as giving the amount of impurities obtained in the commercial conduct of the mine.

Results of these samples, which were taken from fifty mines in fourteen States. are as follows:—

Moisture: (1) Lignite and lignitic coals show higher moisture in the car samples than in the mine samples, but the difference is slight.

(2) Bituminous coals having more than 5 per cent, of moisture usually show less in the car samples than in the mine samples, the loss being about 1.5 per cent.

(3) Bituminous and semi-bituminous coals with less than 5 per cent. moisture usually show a gain in the car sample to the extent of 1.5 per cent.

So few tests were made upon anthracites that they are neglected here.

Sulphur.—The variation between the mine and the car samples is slight. The general average shows an increase in the car samples. This is probably due to more rigid exclusion of impurities in selecting the mine samples than miners ordinarily use in loading commercial coal. The amount of increase is .04, taking into account all the samples made. Hence, at least in the United States, it is probable that in mine sampling it is necessary to multiply the amount of sulphur by 1.04, in order to obtain the actual proportion of sulphur in the working output of the amount. When the percentage of sulphur is small, this increase may be disregarded; but when it is large, as in so many Nova Scotian coals, it becomes an important feature.

Ash.—The greatest and most constant variation is in the ash. Of the 50 analysis, 46 showed a larger percentage and four a smaller percentage in the car sample than in the mine sample. The evidence, then, is overwhelming that in commercial practise more impurity is left in the coal than in any ordinary sampling, or, to put it in other words, that sampling is done so carefully as really to misrepresent the commercial value of the coal. Some of the cars were loaded from run-of-mine coal and others with lump coal, and it was thought at first that this might be responsible for the increase in the percentage of ash. Careful tests, however, showed that this was not the cause. Naturally, also, a certain personal element enters into the question of this class of sampling as into any other; but it appears that, although the percentage of cases of ash obtained by each inspector was different, nevertheless in practically all cases there was an excess in the car sample.

The result of all these tests appeared to show that it is not usual for mine samples to correspond with the commercial output of the mine, and, furthermore, it showed that the personal element must be still further reduced to secure satisfaction. If one man were to do all the sampling, the relative values in the different cars would be correct; but this is practically never possible upon a large scale.

Proposed Method of Mine Sampling.

Quoted, with the exception of geographical references, from Campbell, M. R. Trans. A. I. M. E., XXXVI., 352-353.

1. Select a fresh face of coal, and clean it of all powder stains and other impurities.

2. Cut a channel perpendicularly across the face of the coal from roof to floor, with the exceptions noted in 3, of such a size as to yield at 5 lbs. of coal per foot of thickness of coal bed; that is, 5 lbs. coal for a bed 1 foot thick, 10 lbs. for a bed 2 feet thick, 20 lbs. for a bed 4 feet thick, etc.

3. All material encountered in such a cut should be included in the sample, except partings or binders of more than 0.25 in thickness, and except all lenses or concretions of sulphur or other impurities greater than 2 inches in maximum diameter and 0.5 inches in thickness.

4. The sample may be sent to the laboratory as it is cut, or it may at once be quartered down to about the size of a quart. If it is quartered down, it should be divided into quarters and opposite quarters rejected. The operation of mixing and quartering should be repeated until the desired size of sample is obtained. The operation of pulverizing and quartering should be done as rapidly as possible, so as to prevent a serious change in the moisture content, and then the sample should be sealed in either a glass jar or screw top can, bound with wire tape, and sent to the laboratory for analysis.

5. The analysis of such a sample will show the grade of coal that may be obtained by careful mining and picking. In the majority of cases the sulphur and ash in the commercial output of the mine will exceed the amount obtained from the sample, but this can be approximated by multiplying by certain coefficients. The co-efficients determined in the work of the Geological Survey coal-testing plant last year will not be strictly applic-

able, since the sampling was not done under this system; but they are approximately the same and can be used until more accurate co-efficients are determined. When sufficient data are at hand it seems possible that specific co-efficients may be determined for certain fields; that is, a co-efficient for the Sydney field, another co-efficient for the Western Cape Breton field, etc., and finally, co-efficients may be determined for local sub-divisions of the larger fields, or for certain beds of coal within those fields.

6. All descriptions of samples should state definitely how the samples were obtained, so that the reader may judge for himself the value of the results obtained; and when analyses are recalculated, the co-efficients of increase or decrease should be given, together with the authority for using this co-efficient or the data upon which it was determined.

Mine Pumping with Direct Connected Electrically Driven Turbine Pumps

By P. H. Moore, M.E.

(Paper read before the Nova Scotia Mining Society.)

Introduction.

Few problems in hydraulics present more interesting possibilities, and at the same time have been more universally neglected, than centrifual pumping.

The development of the centrifugal pump has been analogous to that of the steam turbine, and, although both were pioneers in their respective fields, both were almost entirely abandoned in favor of the reciprocating engine before having been exploited, the centrifugal pump because the principles of its action were not thoroughly understood, and the steam turbine engine because of mechanical difficulties in its construction.

As turbine pumping has been until the last few years absolutely unproven as regards practicability in mine pumping, my experiences with turbines in the Micmac Mines, Leipsigate district, Nova Scotia, may be of some practical service to engineers present.

Description.

The motor driven turbine pump is the exact converse of the waterwheel generator set, that is, instead of the turbine driving the generator, the motor drives the turbine. Both motor and turbine are set upon the same base, and are set as close together as the shaft coupling will permit. This makes a very compact and convenient outfit. In lowering such a pump into the mine, it is only necessary to disconnect the coupling, remove the motor and turbine from the base, and lower the pump in three pieces into the mine.

The only moving part of a single stage turbine pump is the hollow disc, or impeller, which is made of composition or cast iron, and is enclosed in an air-tight pump casing. This impeller has an opening at its axis for the suction, and numerous openings in its circumference for its discharge. Inside the hollow disc, or impeller, are a series of curved spokes or vanes, which serve as partitions between the openings in the circumference. These vanes are placed in the same manner that guide veins are placed in a reaction turbine waterwheel, and are curved so as to form tangential expanding ducts, from which the water emerges at about the velocity existing in the discharge chamber of the pump. The water enters the impeller axially, and issues radially.

Without going into further details as to the numerous designs employed in turbine pumps, I may say that modern ingenuity has so designed high head turbines that there is practically no drag or friction between the periphery of the rapidly revolving impeller and the water in the discharge chamber.

Principle Involved.

The principle of centrifugal force is employed the same in high head turbines as it is in the old-fashioned, low head centrifugal pump, although the mechanical construction is improved to suit the work for which it is built.

A single stage turbine may be designed in such shape and driven in such speed that it may pump against a head of from 50 to 150 feet, with wide variations. Wherever it has been necessary to pump against extremely high heads, the practice until the past few years has been to have the discharge of one turbine led by a pipe directly into the suction of another, and so on, thus multiplying the lifting capacity by multiplying the pumps until the required head was reached. The modern practice, however, has taken advantage of the convenient size and shape of the turbine in a very economical manner. The multi-stage turbine of to-day has a series of impellers mounted upon the same shaft, and all enclosed in the same case, and are arranged in such a way that the speed of the water may be multiplied in proportion to the number of impellers used. The capacity of such a pump is only limited by the number of impellers, and the amount of power necessary to drive them.

Such a pump is to-day pumping water against heads as high as 2,000 feet, and doing it with remarkable economy.

Micmac Pumps.

In the Micmac Mine we have a three-stage, three-inch turbine station pump, with a capacity of 230 gallons per minute against a 300 foot head, driven by a 30 horse-power direct current motor; and a three-stage, two-inch vertical turbine sinking pump of 100 gallons per minute capacity against a 250 foot head, driven by a 10 horse-power direct current motor.

The speed of both the above pumps is controlled by a variable speed resistance coil. The ordinary speed of both pumps is about 1,150 revolutions per minute. The station pump has a three inch discharge pipe and a three inch suction.

Starting the Pump.

There are some peculiar features about starting and running a turbine pump that may be of interest to such of you as have had your troubles with pumps of other descriptions. To start our turbine pump, we first drain all the water out of the discharge pipe through a bipass, leaving the pump and suction full of water. We have a gate valve in our discharge pipe close to the pump. This we close as soon as the pump is primed. We then start our motor with an auto release starter, and get it running up to full speed, still keeping the gate valve in the discharge pipe tightly closed. When the motor is up to speed, we gradually open the discharge pipe until the gate valve is wide open. By that time the pump is throwing at its full capacity. You all know what would happen if we undertook to close the gate valve in a discharge pipe on an ordinary steam or jack head pump while the pump is running, or started the pump with such valve closed when the pump was full of water. At any time while the turbine pump is running we can close the gate valve in the discharge pipe, or the gate valve in the suction, or both, and do the pump no harm in any way. After running a few minutes with the discharge closed, the water in the pump gets hot. I never experimented to see just how hot the water would get if left running any length of time, as it might be an expensive experiment.

The amount of water that a turbine pump throws can be controlled either by the gate valve in the discharge pipe or the gate valve in the suction. The pump will only take power proportionately to the amount of water it is throwing, which is a great convenience in mine pumping.

In case the current is cut off on deck, the auto release starter flies back and the power is automatically shut off from the pump, and it cannot be started again except by the proper manipulation of the auto release starter. This auto release starter pre-

cludes any possibility of the motor being started under full current from the deck.

I wish to particularly call the attention of pump men present to the fact that the Micmac pump is pumping 230 gallons of water per minute against a 300 foot head, through a three inch pipe. There is not another style of pump in existence that will throw that amount of water through so small a pipe and work at anywhere near its economic efficiency.

This turbine takes up about one-third the room of a reciprocating pump of equal capacity, and the cost, including the motor for driving, is only about one-half. The pump runs with practically no noise, the low hum of the motor being hardly noticed. There is no vibration in the discharge pipe, and the flow of water is perfectly steady, there being no throbbing or pulsations in the stream discharged, the water being driven through the pipe at a tremendous speed.

The turbine sinking pump is started in exactly the same way as the station pump. A description of this turbine pump may be interesting. Where the station pump is set upon a horizontal base, and the pump and motor run upon a horizontal axis, the turbine sinker is arranged to run vertically, the motor above the turbine. This vertical sinking pump is arranged in a cast iron water-tight housing, so that in case the shaft fills up with water the pump will run submerged as well as it will out of water. There is a pipe connection in this cast iron housing that a small air pipe may be connected, if necessary, to facilitate the introduction of compressed air into the jacket, and thus keep out all moisture that may accumulate from the sweating of the cast iron while the pump is under water. We have never had our turbine pump submerged long enough to make it necessary to use compressed air. With compressed air the pump may be used submerged for long periods of time.

The only objection to a direct current motor in a sub-aquatic pump of this description is that we are obliged to attend to the brushes and commutator through hand holes cut in the cast iron casing. An induction motor with an alternating current makes a better outfit, and this is the current we are preparing to use in our new electrical installation.

Our sinking pump is throwing 100 gallons of water per minute against a 250 foot head through a two inch pipe. The suction is of the same size as the discharge pipe, owing to the fact that the water is picked up at the same speed that it is thrown out.

Method of Using the Turbine Sinker.

The convenient size and shape, and lack of moving parts make the turbine sinker ideal as a sinking pump. Our sinking pump is hung by chains from differential pulley blocks in any position in the shaft that may be convenient. All pump men know that in using a steam sinker it is necessary to get the pump in such a position that you can connect at least two lines of pipe to it, and sometimes three when the exhaust is carried to the deck, or to some other part of the mine. With a turbine sinker, you have only one line of pipe to connect to your pump.

In order to make our sinking pump more flexible, we use an ordinary rubber fire hose, one end of which is connected to the discharge of the pump, and the other end to the discharge pipe. This gives the pump a chance to be left in any position convenient, and the pump may be lowered without stopping it and without losing its water, and no care need be taken that it is in any particular position. In pumping out a shaft, this style of pump is invaluable, as there is no time lost in pumping while lowering the pump. Owing to its sub-aquatic qualities, we can lower it as far down into the water as the length of the discharge hose will permit. There being no vibration to the pump, a discharge hose will last as long as an iron pipe.

The only objection we have ever found in using our turbine pump, is that in case the turbine loses its water owing to the necessity of moving the discharge hose while the men are working in the bottom, it is necessary to drain the discharge pipe before starting the pump and getting it to take its water again. We have found that gritty water, and any gravel that it large enough to go through the strainer of the suction hose, is handled without injury to the pump.

The small flexible cable that is necessary to carry the current to the pump is covered with a waterproof covering, and has given us no trouble whatsoever.

The auto release starter and variable speed coil are kept in a wooden box at any distance above the pump that is convenient.

Owing to the remarkable fact of having perfect control, by means of the gate valve in the suction or discharge, of the amount of water pumped, the men sinking very learned to adjust the discharge of the pump to the amount of water that the shaft was making, and consequently we have had but little trouble with the sinking pump losing its water.

In case of unexpected springs of water being encountered, the variable speed resistance coil makes it possible to turn the motor up several hundred revolutions per minute above its ordinary speed, so that for some hours a turbine is capable of pumping at least a third over its rated capacity without injury to the motor.

Turbines Compared with Steam and Jack Head Pumps.

We have been running the two turbine pumps mentioned for over a year, and have generated our power to run them in our own shaft house, by driving a 35 killowatt generator with a 75 horse-power engine. We have run a certain number of steam pumps all the time during this year, and have had a splendid chance to compare steam and air pumping with electric turbine pumping.

Where the theoretical power required for a steam pump is about one-third of that actually required by an electrical turbine pump, the enormous losses in steam power through condensation and leaks, the friction in the pump, the numerous delays from breakdowns, the innumerable expenses of packing, oil and attendance, with the nuisances caused by noise and exhaust, more than balance the theoretical power saving in using steam reciprocating pumps over steam generated electrical power for running turbine pumps.

Undoubtedly the old jack head pump run by a Corliss engine is very economical, so far as power is concerned, in mines that have fairly straight shafts, and are not at any great depth, and where there is only a small amount of water to pump, but in deep mines, with large amounts of water to be considered, with more or less irregularity in the dip of the shaft, and where economy in space is to be considered, the turbine pump has proved to be as far ahead of the old jack head pump as the jack head pump is ahead of carrying water in a bucket.

A reciprocating steam pump has innumerable parts that have to be removed and constantly attended. The expenses for packing, and oil, for machines of this description is enormous, compared with turbines. The numerous lines of pipe need continual attendance, and most careful installation; the frictional losses are enormous; the wear and tear of a steam pump in a mine is heart-breaking; the noise is a nuisance; the room it takes up is inconvenient, and the first cost is nearly twice that of a turbine.

In a motor driven turbine there are no valves to pack, no guards or springs, no reciprocating parts, and, most important of all, there is not a contact surface in the entire machine except the shaft and its bearings. The design is such that parts subjected to the action of mine water may be made of acid-resisting metal, and when desired lead-lined pumps can be obtained. The space occupied is less than one-third of that of a reciprocating pump of that capacity. The discharge pipe is much smaller, and there is only one line of pipe. Since there are no rubbing surfaces exposed to the water, the pump will run for years without renewal or repairs, and it will pump anything from thick mud to the cleanest water without injury. In case of accident, the parts are so few, and the construction so simple, that any parts of the machine can be replaced in less than an hour. The cost of attendance is reduced to the minimum, since the only necessary attendance is to see that the pumps and motor are properly lubricated.

Our turbine pump uses about one pint of motor oil in sixty days. All the bearings work in oil, and there is no drip and no waste. The oil is literally worn out.

CONCLUSION.

Our turbine pump in the Micmac Mine has cost just $2.64 for new brushes in the thirteen months that it has been running incessantly. This is the only renewal that has been made on the pump.

With this experience to base my opinion on, I may say that I am convinced that even with steam generated electrical power, a motor driven turbine pump will pump more dirty, gritty water against a high head with less expense per gallon pumped than any other pump ever before invented.

MINERAL PRODUCTION OF BRITISH COLUMBIA

The following information concerning mineral production of British Columbia was given by Mr. E. Jacobs, editor of "The British Columbia Mining Record," in the course of his remarks on this subject at the recenty-held annual meeting of the Canadian Mining Institute:—

British Columbia's total mineral production to the end of 1905 is shown in official publications to have been in value nearly $249,000,000. Adding that for 1906, estimated at rather more than $26,000,000, a grand total to the end of 1906 of, approximately, $275,000,000 is obtained. This production was apportioned in round figures as follows:—

Placer gold—		
Lode metals		$ 58,700,000
Gold	$41,500,000	
Silver	25,900,000	
Lead	17,700,000	
Copper	36,000,000	
Iron and zinc	200,000	
		121,300,000
Total metalliferous		$191,000,000
Coal and Coke—		
Coal	$73,000,000	
Coke	6,500,000	
	$79,500,000	
Building materials, etc.	5,500,000	
Total non-metalliferous		85,000,000
Grand total		$275,000,000

Reviewing several periods, its is seen that from the commencement of mining operations in the Province to the end of 1886, the total value of production was $64,246,000, in the following proportions: Placer gold, $53,797,000; coal, $10,449,000. In the ten years, 1887-1896, a total of $37,809,000 was produced, consisting of placer gold, $5,006,000; lode metals, $8,126,000, coal and coke, $23,537,000, and buildings materials, etc., $1,140,000. For the ten years, 1897-1906, the total was $173,000,000, comprising placer gold, $9,889,000; lode metals, $113,299,000; coal and coke, $45,441,000, and building materials, etc., $4,371,000.

Recapitulating, the production of the respective periods above mentioned was as follows:—

To end of 1886	$ 64,246,000
Ten years, 1887-1896	37,809,000
Ten years, 1897-1906	176,000,000
Total production, all years	$275,000,000

The progress of British Columbia's mining industry is further indicated in the following summary:—

COAL AND COKE.

Coal mining appears to have been commenced in 1836, but production must have been small during 30 years to 1865, inclusive, official records showing a total value for the whole of that period of only $666,288. It was not until 1884 that the total for any single year reached $1,000,000, the recorded value for that year having been $1,182,210. As already shown, the total value to the end of 1886 was $10,449,000. During the next period, 1887-1906, the production of $23,537,000 included $7,825 for coke, the manufacture of which was commenced at Union, Vancouver Island, in 1895. Of the total of $45,441,000 for coal and coke during the period 1897-1906, the production of the latter was $6,565,000, chiefly from the collieries of the Crow's Nest Pass Coal Company, at which coke-making was begun in 1898.

PLACER GOLD.

The production of placer gold dates back to 1858, in which year a total value of $705,000 was recovered. The maximum production in any one year was that of 1863, with a value of $3,914,000, followed the next year by a total of $3,736,000. This was when placer mining was at its best in the Cariboo district. In the seventies there was a gradual reduction, while through the eighties the decrease was more marked ,continuing into the early nineties. The minimum yearly total was reached in 1893, the production for that year having been only $356,000. Thenceforward there was a steady increase. The yearly average total recovery during ten years, 1897-1906, was about $988,900. The total production during 49 years has been in round figures:—

In nine years, 1858-1866	$23,675,000
In ten years, 1867-1876	19,790,000
In ten years, 1877-1886	10,340,000
In ten years, 1887-1896	5,006,000
In ten years, 1897-1906	9,889,000
Total	$68,700,000

LODE METALS.

The tables of production of lode mines, published in the "Annual Report of the Minister of Mines for British Columbia," show that a commencement was made in 1887, in which year silver and lead to a total value of $26,500 was produced. The first official record of lode gold was a value of $23,400 for the year 1893, and of copper $16,200 for 1894.

Gold.—Out of a total of about $41,500,000 of lode gold, not quite $2,200,000 was produced during four years, 1893-1896, and yearly production during five years, 1902-1906, has been $4,878,000. In 1906 a total exceeding $5,000,000 was reached, and it is expected that henceforward there will be an annual increase over that amount.

Silver.—Production of silver during ten years, 1887-1896, totalled $4,028,000, of which $2,100,000 was produced in 1896. The yearly average value during the ten years, 1896-906, was $2,187,200, with a maximum of $3,273,000 in 1897 and a minimum of $1,521,000 in 1903.

Lead.—The production of lead was small during the period 1887-1896, having totalled only $1,581,101. During the following ten years an average yearly output of $1,556,706 was maintained, with a maximum value of $2,691,887 in 1900, and a minimum of $689,744 in 1903.

Copper.—No copper was produced until 1894, in which year a beginning was made, with an ouput valued at $16,234. For the three years 1894-6, a total of $254,802 is recorded. Thereafter the average yearly production for ten years was $3,569,321. The output of 1906, estimated at $8,690,000, was by for the highest for any year since production was begun.

PRODUCTION OF 1906.

Turning now to the production of 1906, which was a record year in the history of mining in British Columbia, it is especially noteworthy that this single year's production, estimated at $26,390,000, was not very far short of one-tenth of the total for all years to date (one-tenth would be $27,500,000). While the high prices of silver, lead and copper contributed in large measure to the considerable increase in value of the year's production over that of any other year, there was also an enlarged output of lode gold, silver, copper, coal, and building materials. Copper especially made a substantial gain in quantity—about 7,300,000 lbs. more than was prdouced in 1905. Coal also showed an appreciably large increase over the production of 1905, while the output, estimated at 1,530,000 tons, was the biggest tonnage reached in any single year.

The causes for a decrease in 1906 as compared with 1905 in the production of placer gold, lead, zinc, and coke, respectively, were temporary, and the reasonable expectation is that they will not similarly affect the production of those metals in 1907.

As exhibiting the importance of mining in comparison with other staple industries of British Columbia, the following estimate of production in 1906, made by "The Victoria Colonist," at the close of that year, is submitted:—

Lumbering	$ 9,500,000
Agriculture	8,000,000
Fisheries	8,000,000
Together	$25,500,000
Minerals	26,350,000
Manufactures	11,000,000
Total	$62,850,000

It will be seen that the estimated total value of the mineral production exceeded that of the products of lumbering, agriculture and fisheries combined. While this is a decidedly creditable showing for the mining industry of the Province to have made, the immediate outlook is that when the time shall come for a corresponding comparison for 1907 to be made, the mineral production for that year will be found to have reached a still more favorable relative position.

In general, the auriferous black sands of California may be described as consisting of hard minerals ranging in specific gravity from 3 to 7, mingled with small percentages of metals and metallic minerals reaching from 7 to 20 in specific gravity. Most of the value will be found in the sand below one-eight inch diameter.

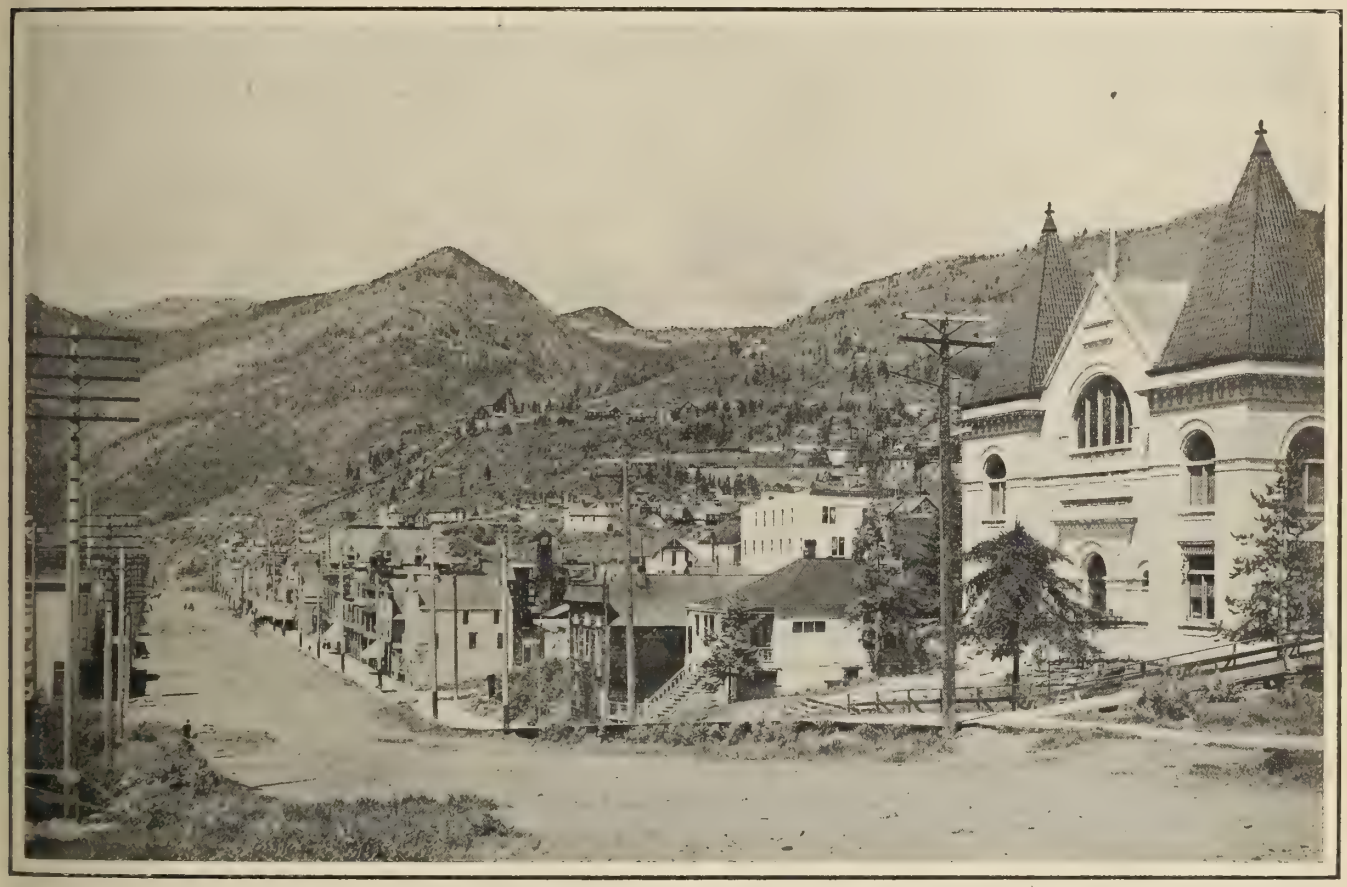
As to the relative value of disseminated and vein graphite, it is held by a Canadian authority, Mr. H. P. H. Brumell, that the advantage lies with the former variety by reason of its uniform character and continuity of deposits.

THE CONSOLIDATED MINING AND SMELTING CO. OF CANADA, LIMITED, ROSSLAND, B.C.

GEO. A. OHREN.

The advent of the Consolidated Mining & Smelting Company of Canada, Limited, into Rossland camp has been an important step towards establishing a prosperous future for this district. The first move in the formation of this country, the consolidating of the War Eagle and Centre Star interests, in the latter part of 1906, was made at a time when mining affairs looked glum, indeed, for the low grade properties of Rossland. It was the general understanding, from reports made by prominent mining men, that there was practically no ore in sight in the mines on Red Mountain, and that the future outlook for these (now prosperous) properties was not assuring by any means.

The amalgamation of the Centre Star and War Eagle holdings



COLUMBIA AVE., ROSSLAND
Consolidated Properties in Red Mountain to Right of Photo. Le Roi Headworks also to right.

being completed, the promoters absorbed the interests of the St. Eugene Mining Company at Moyie, B.C., controlling Canada's premier lead-silver mine, and those of the Rossland Power Company and the Canadian Smelting Works, at Trail, B.C., six miles, as the crow flies, from Rossland; the latter concern being one of the most up-to-date copper smelters and lead and silver refining plants in the West.

One laudable feature of the consolidation was the straining off of a considerable quantity of "water" from the capital of the combined interests over five million dollars having been written off the former capitalization.

The company was capitalized on the following basis:—

St. Eugene Mining Company—Old value, $3,500.00; new value, $2,333,300.00.

Centre Star Mining Company—Old value (estimated cost), $4,666,667.00; new value, $1,555,500.00;.

Trail Smelter—Old value, $1,500,000.00; new value, $750,000.00.

Rossland Power Company—Old value, $600,000.00; new value, $60,000.00.

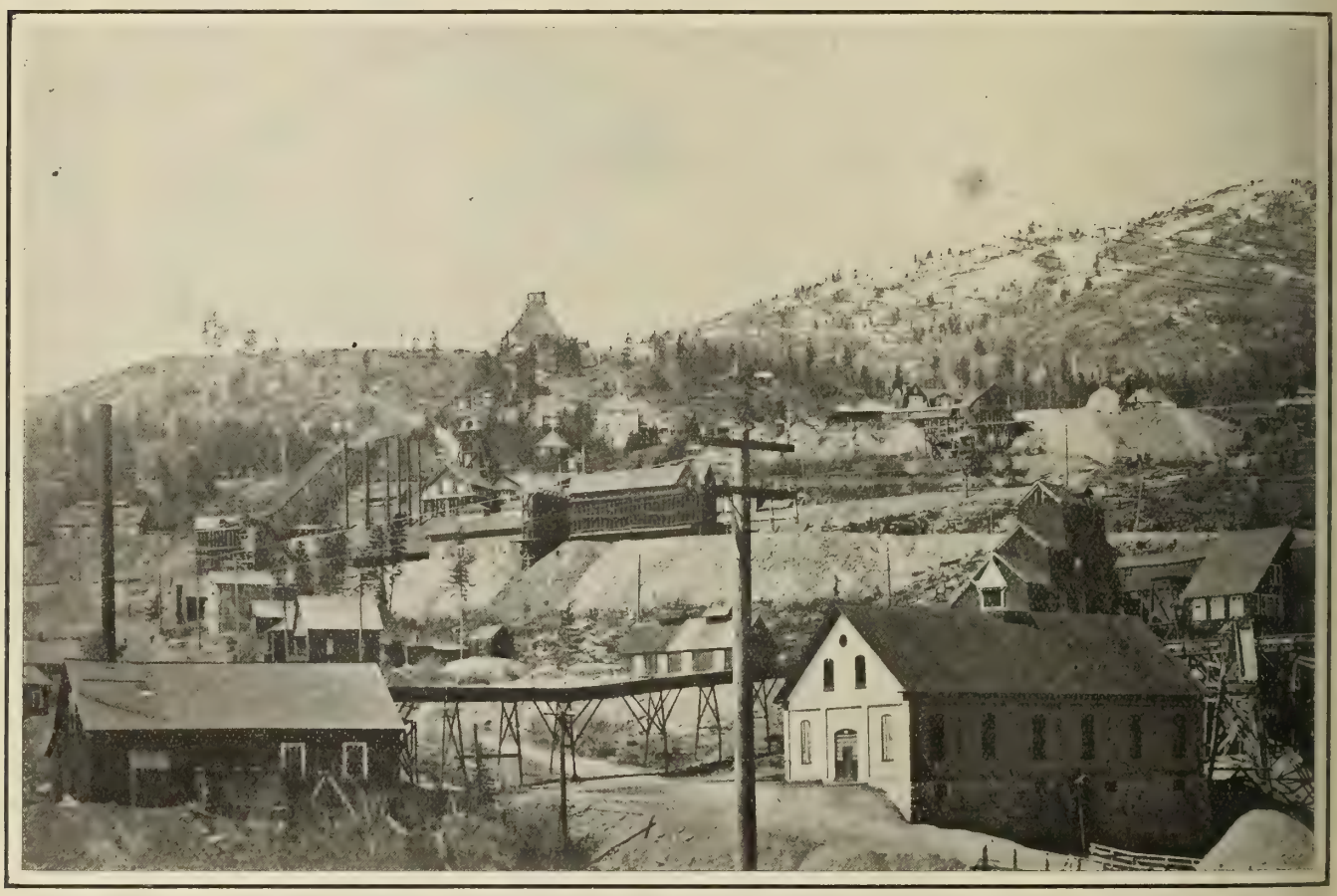
Total old value, $10,266,667.00. Total new value, $4,698,800.00.

The Consolidated Company has just completed negotiations for the Idaho and Enterprise properties, adjacent to the Centre Star, in this camp. The completion of this transaction gives the Consolidated control over the following group of very valuable mineral claims, which adjoin one another and can be worked on an economical basis: Centre Star, War Eagle, Iron Mask, Idaho, Enterprise, Mugwump, Pilgrim, Monita and Red Mountain. These claims represent the consolidation of five different mining companies' interests, as the Centre Star, War Eagle, Iron Mask, Mugwump and Red Mountain were at one time owned and controlled by five different companies, from whom the Consolidated subsequently acquired them.

Under the direction of Mr. R. H. Stewart, mines manager, more ore has been opened up in the properties and blocked out than ever before in the history of the mines, and there is no doubt in and about the mines and shipments of ore largely increased, which will mean more dividends for the shareholders and greater prosperity for this district.

In the report to the shareholders, for the last fiscal year, ended June 30th, 1906, it is shown that after writing off the expenses of incorporation and $45,905.00 as depreciation on plant and equipment, the operating profit was $325,854.93. From this a special reserve of $20,000.00 was provided, and two dividends, amounting to $234,940.00, had been paid, leaving a balance to the credit of the profit and loss account of $70,914.93. Needless to say, the report for the fiscal year ending June 30th, 1907, will surpass the above showing, and it is to be regretted that it is not at hand at the time of this writing, that comparisons might be made.

In addition to the aforementioned properties and interests, the Consolidated Company is operating the Snowshoe Group in



VIEW OF WORKS CONSOLIDATED MINING AND SMELTING COMPANY, ROSSLAND, B.C

but that the Consolidated Company will enjoy a prosperous life for many years to come.

A hundred and one facilities and improvements have been made in the mine and surface workings during the last few months. A large amount of development work and thousands of feet of diamond drill prospecting have been carried on in the mines; new and more commodious buildings have been erected on top; they have installed their own rock crusher and automatic sampler, now doing this work at the mines that previously was done at the smelter, with more or less inconvenience to all concerned. They have greatly augmented their air compressing plant, and at the present time are installing three electric locomotives, for hauling ore underground, and a one thousand horse-power steam hoisting plant. This engine will lift a load of ten tons, including the skip and the heavy 1 1-4 inch cable, at the rate of two thousand feet per minute, and when the installation of this collosal hoist and their air compressing, electrical and other machinery now being put up is completed, many more men will be put to work

Phœnix (Boundary) camp, under a lease from the Snowshoe Company. This group consists of the Snowshoe, Pheasant, Alma Fr and Fairplay Fr. They are also installing some new machiner and increasing their air compressing plant at that point, an will work the property on an extensive scale in the immediat future.

The Centre Star, War Eagle and Idaho claims were among th first located on the southern slope of Red Mountain; the loca tions being made in July, 1900. The War Eagle group was sol in December, 1896, to the Gooderham Syndicate, of Toronto, Ont for $700,000.00, after it had paid the former owners $187,500.0 in dividends. Patrick Clark bought the property with anothe claim and a two-thirds interest in the Iron Mask for $25,000.0(in 1894. The Centre Star was purchased by Oliver Durant an associates in 1891, and in 1897 was bought by Geo. Gooderhan of Toronto, for $2,000,000.00.

Teh Ware Eagle paid $545,250.00 in dividends, and the Centr Star the sum of $210,000.00, before their absorption by the Co

solidated Company, which has paid quarterly dividends of 2 1-2 per cent. since the declaration of their first division of profits, May 1st, 1906, and to date have paid their shareholders $587,350, including the dividend just declared.

The smelter at Trail was built in 1896 by F. Aug. Heinze, of Butte, Mont., who built the first railway (narrow gauge) into Rossland, from that point. The initial shipments of ore treated at the Trail smelter cost the mine owners around fourteen dollars per ton for freight and treatment. This rate has been reduced step by step during the last few years, until at the present time the smelter is handling low grade Rossland ores for four dollars per ton, and, it is stated, under that, at which treatment rate there are mountains of low grade ore in the hills surrounding Rossland which can, and will, be mined and treated for many years to come.

STATUS OF THE MINING PROFESSION

By J. C. Gwillim, Kingston, Ont.
(Toronto Meeting, 1907.)

At the late meeting of the American Mining Congress, October 16th to 19th, 1906, Governor Pardee, of California, introduced the draft of a bill intended to make the dishonest promoter fear the law. The bill is as follows:—

"An Act to prohibit the making or publishing of false or exaggerated statements or publications of or concerning the affairs, pecuniary condition, or property of any corporation, joint ments of publications are intended to give, or shall have a tendency to give, a less or greater apparent value to the shares, bonds, stock association, co-partnership, or individual, which said state- or property, or any part thereof, of said corporation, joint stock association, co-partnership, or individual, than the said shares, bonds, or property shall really and in fact possess, and providing a penalty therefor.

"Section I. (Enacting Clause).—Any person who knowingly makes or publishes in any way whatever, or permits to be so made or published, any book, prospectus, notice, report, statement, exhibit, or other publication of or concerning the affairs, financial condition, or property of any corporation, joint stock association, co-partnership, or individual which said book, prospectus, notice, report, statement, exhibit, or other publication shall contain any statement which is false or wilfully exaggerate, or which is intended to give, a less or greater apparent value to the shares, bonds, or property of said corporation, joint stock association, co-partnership, or individual, or any part of said shares, bonds, or property, than said shares, bonds, or property, or any part thereof, shall really and in fact possess, shall be deemed guilty of a felony, and upon conviction thereof shall be imprisoned for not more than 10 years, or fined not more than $10,000, or shall suffer both said fine and imprisonment."

The Congress unanimously adopted the bill, and the following resolution:—

"That the officers of the American Mining Congress respectfully suggest to Governors of States and Territories that when in any State which has adopted the law, known as the Pardee resolution, charges of its violation are made, the Governor of the State in which alleged mining properties are claimed to exist, at his discretion may, upon request, authorize the Commissioner of Mines, or other appropriate officials, to examine such alleged mining properties sufficiently to determine and report on their approximate reality, and the State may charge a reasonable fee to cover the cost of such examination and report, this fee to be paid by the parties requesting such examination."

The following resolution was also adopted:—

"That a committee of five members be appointed by the President of this Congress, for the purpose of devising and demonstrating methods for preventing fraudulent mining schemes, and report the same to the Secretary of this Congress eight weeks before the meeting of its next session, who shall mail such report to each member of this Congress at least three weeks before its next session."

There has been some comment upon Mr. Pardee's resolution. Some affirming that so long as a constituency of dupes and gamblers is to be found, so long will the "get-rich-quick" scheme prosper. Others again suggest that all the mining engineers in Denver look up the cases, which should be investigated to prove misrepresentation.

It is argued, moreover, that we now have a law covering the obtaining of money under false pretences, by which men may be found guilty of misdemeanor or felony, according to the magnitude of the offence.

The fact, however, stands, that misleading literature and often absolutely untruthful statements are circulated to a lamentable degree by company promoters, without challenge. Yet the effects thereof are ruinous to legitimate mining.

To the Journal of the Federated Canadian Mining Institute for the year 1897, the late Mr. J. Bawden, barrister, of Kingston, contributed a paper on the subject of "The Economics of Joint Stock Companies," written at the time of the late British Columbit mining speculation.

At the present time, in Ontario, and in many other mining districts of this continent, conditions are not dissimilar to those obtaining in 1897. It may not, therefore, be out of place to call attention to some passages in Mr. Bawden's paper, relating to the promotion of the gambling element in mining. He says: "Let the buyer beware. The law interferes only to protect men's stomachs from adulterated food, not by any preventive process to protect from pickpockets in the guise of vendors of valueless shares. The question whether in the interests of the public it is advisable to interfere with the right to sell valueless shares lest individual liberty and the inalienable rights of British subjects be imprudently invaded, is a question of expediency which those who have at heart the development of mining enterprise may discuss without a tilt with brokers or jurists. The sale of worthless shares injuriously affects the sale of valuable shares. It goes without saying that capital seeking investment in mining shares is a limited quantity; that it is coaxed out of hoards, at the cost of much wind in the form of reports, advertisements, puffs, editorials; and that the characters of many people are staked upon representations, sometimes made in good faith, but too often discredited by adverse results. The argument, therefore, against the legality of worthless shares is founded on the economic ground that the business should be prohibited by legislation because it will work irreparable injury to honest enterprise."

It is often affirmed that mining is, in any case, a gamble; this is not true. There are many mining enterprises carried on in such a way that the gambling element is almost eliminated; but these *bona fide* enterprises cannot operate in a field where properties have been given a fictitious value, due to stock promotion and manipulation. It is said *Chance* is so large a factor in mining that, from the view of the investor, this industry suffers in comparison with other industrial enterprises. But, the writer ventures to assert, if roguery, misrepresentation, and lack of skill were emilinated from mining, to the same degree as they are absent in the operation of railroads, manufactures, and

other industrial undertakings, we might deal successfully with the element of chance, and reduce speculation to investment. Mr. Bawden further remarks: "Industrial stocks cannot be put on the English market without estimates carefully prepared by chartered accountants. The plan of organization of such companies leaves nothing to be desired in the way of reasonable safeguards for the protection of shareholders." And again: "The mining share certificate neither binds nor obliges any. In fact there is not a more innocent, vague, unrepresentative and yet plausible piece of paper in the world than a mining share certificate. It may stand for a share in a mine which has no existence; for a part of the capital of a scheme which never had and never will have a dollar in its treasury; or it may represent the title to a share in a 'bonanza,' honestly administered, paying the largest profits ever realized, and be good documentary evidence of the ownership of value many multiples of the money share stated on its face."

Such a condition is accepted by many of us as inevitable. If, then, mining is so much at the mercy of chance and unscrupulous people, what is the object of educating men to become technical engineers, unless it be to infuse into the industry a higher level of honesty and attainments, which shall do as much for the mining profession as Scientific Medicine has done for sickness, to eliminate "The Act of God" and "Ignorance"? Surely the jeopardy of life is as great as that of mines. Yet medical science has gathered honor and a considerable control of its specialty. Mr. W. R. White, in the discussion following Mr. Bawden's paper, said: "I do not agree with Mr. Bawden's position, when he speaks in regard to the institutions that are turning out young men; I do not think these young men when turned out are competent to do much more than push a barrow in a mine. They may get technical knowledge, but they require the practical experience before they become mining experts or engineers; they are no better than beginners in any other profession in this respect."

A period of probation is certainly necessary to acquire experience and knowledge in all professions. It would be a benefit to mining engineering if all who are training could work for a time as "understudies." A great majority now do this, but there seems to be no good reason why a mining graduate should pass through the mucking, wheelbarrow stage while graduates in civil engineering, law or medicine pass directly into professional work. Surely there are equally wanting in practical experience. Moreover, the graduate of our mining schools is nowadays as well equipped as men graduating into other professions to do efficient service. Give him his place and honor, and he will work as honestly and as well as any other young professional man. The every day accusation against mining is its *Chance* and *Misrepresentation.* Surely the technical graduate has not spent four years in learning how to increase these factors. Mismanagement is not often in his power, and if it is, he has as much at stake as the practical man. Concerning this, Mr. Bawden says: "As a general rule, the so-called mining expert is, in cases of mispresentation, the chief wrong-doer. The evil will, it is hoped, diminish with the increase in numbers and respectability of mining engineers. The director is often the dupe of the expert and prospector as the means of luring ignorant shareholders. The engineering profession owe it to themselves and to the best interests of the country that they shall have a registered membership.

"We shall have ere long a registered body of mining engineers zealous for the reputation and honor of a learned and noble profession, from whose lists will be struck off any guilty of unprofessional conduct." The codes of professional ethics in civil engineering, law and medicine demand the protection of the public in their own interests. In mining, the investor cannot invest because of the speculative and fictitious values of mining property. While, on the other hand, the graduate, or otherwise trained and honest engineer is forced to compete professionally with a host of so-called and self-styled "mining men" who are ready enough to become the tools of the promoter. But the question remains, how to remedy this state of affairs. The channel chiefly used by the promoter to reach the public is the newspaper advertisement, carefully worded and couched in the language of exeggeration, calculated to entrap the unwary. It is well known that it is no difficult matter to secure all the capital necessary to exploit a really meritorious mining property without resource to advertising; and, consequently, the majority of schemes to which the public are invited, by the advertising method, to subscribe, may be regarded with suspicion. The press, meanwhile, disclaims responsibility; the statements, as published, are frequently not even vouched for by a reputable person, much less by a technically qualified man; yet the public speculates, and the mining profession loses both credit and occupation.

Among the purposes for which the Canadian Mining Institute was founded are these: "To take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada"; and "to encourage and promote these industries by all lawful and honorable means."

Dr. J. Bonsall Porter, discussing Mr. Bawden's paper as above mentioned, remarked: "We engineers cannot, of course, undertake the Herculean task of putting down or even denouncing all of these frauds, but I do think that many of us, and perhaps the Society as a unit, falls short of its real duty'.'

The writer would suggest that the Canadian Mining Institute, which is in part supported by annual grant from the Federal Government, undertake to deal with at least this abuse, namely, the publication of prospectuses of an irresponsible character, the statements in which are not vouched for by some person of recognized standing.

If such advertisements disappear entirely under these restrictions, the loss will fall only on newspaper publishers and on those who prey upon or mine the public. Meanwhile other professions are protected by legislation whereby they are raised above the level of the unscrupulous and incompetent. The Manitoba and Quebec Acts of the Canadian Society of Civil Engineers are for the purpose of the protection of both public and profession. So are the British Columbia Assayers' Act and the Acts which protect the legal and medical fraternities. If any unqualified or irresponsible person were permitted to practice his profession without question, what complications and dangers would ensue! The State interests itself in mining to the extent of taxing, limiting and protecting the prospector, and inspecting his claims, but there is yet no effective law to protect the public from the fradulent promoter, or to provide for the inspection of so-called mines offered to the public. The press, as an interested party, aids and abets the promoter, whose prospectus is circulated among thousands of readers who know nothing of mining, mining engineers or conservative mining journals.

To remedy this evil, such advertisements should be published subject to restrictions and in fear of penalties, as suggested by the Mining Congress. There might also be stricter regulation governing the issuance of letters patent incorporating companies. Promoters should ,furthermore, be made personally responsible and answerable for their published statements. Again, an incorporated company, before going to the public, should be required to have paid-up capital to a reasonable amount, which would at least be paid in first of all; this would ensure the company having some guarantee of *bona fide* intention. This paid-up capital might be either held as a guarantee fund or used in the company's operations. The company might be made responsible for the statements contained in the prospectus issued, and this fund held available for any loss sustained.

A method which would apparently prove most effective would be to insist that reports for prospectus purposes be prepared and signed by professional men, who would be brought to book professionally for misstatements or misrepresentation.

Mr. George E. Collins, writing in the *Denver Mining Recorder,* anent the "Pardee Resolution," says:—

"The only people competent to say whether a man is qualified to practise as an engineer are his own fellows. I think the time

has come for the American Institute of Mining Engineers to follow the example of its English junior (The Institution of Mining and Metallurgy) and confine its membership to such as have attained a definite standard of qualification and experience. This qualification, in any case, could not mean much, but would be better than nothing. . . Later, State Legislatures could enact that no person should be placed in responsible charge of property employing more than a certain number of men, or should presume to make a written report for money on a mining property unless he were a member of this body.''

An editorial leading article in the same journal, October 19th, 1906, contains the following praagraph:—

''Has not the mining industry reached that degree of importance and magnitude when some States, at least, should take steps to discriminate in regard to who shall practise the science and art of mining? It is sometimes said, surely the qualified man can compete successfully; therefore why form a protection for him? The protection as in civil engineering, medicine, and law, is not wanted for merits, but for honest, competent work to replace misrepresentation.''

RECENT MINING DEVELOPMENT IN THE SOUTHERN YUKON

By D. D. Cairnes

(*Continued from page 87*).

minerals being galena, with sometimes grey copper, chalcopyrite, pyrite, melaconite, and malachite, and, as a rule, are very persistent and can be traced in some instances for several miles. Outcrops of quartz, very much resembling each other, are seen in almost straight lines, at short intervals, and with the same general strike from the Watson river to about 8 or 10 miles south of the Wheaton river, a distance of nearly 20 miles. Although most of the veins found were in this belt, about 2 miles wide; towards the end of the season Mr. Porter and others discovered some large deposits of quite pure stignite, and other minerals, at a considerable distance west of this belt.

Only a small amount of the rich telluride minerals, which were sylvanite, hessite, and telluric ochre, was found, but no work had been done on any of the claims, when last seen, except a limited amount on the Gold Reef. A government wagon road was built from Robinson to Gold Hill immediately after the discoveries were made. Assays as high as $300.00 and over, in a place or so, and a number of fairly average assays from $20.00 to $60.00 were obtained. Recently the writer has been informed by several disinterested parties that the Tally-ho Mining Company, whose property is situated on the north side of the Wheaton river, in the line of this Gold Hill mineral belt, has over two feet of quartz at the end of a 70 foot tunnel which averages over $200.00. The rest of the vein is lower grade. The property is still working, and the ore is being freighted out to Robinson to ship to the Tacoma Smelting Works.

The copper deposits just west of the town of Whitehorse have been known for some years, and considerable work has been done on some of the properties. However, for several reasons these have not developed as rapidly as might have been expected. Freight rates were high, either for getting in supplies or shipping out ores, and to treat the ore on the ground coke was required, and no coking coal was known to exist in the country; and to bring in coke made treatment very expensive. Also one of the first reports written on the district was one by R. H. Stretch, written for the W. P. & Y. Railway, but which was afterwards published in the *Engineering and Mining Journal*, in September, 1900, and which may also have had a tendency to keep capital out. In this report Mr. Stretch claimed the granites would be found underlying the limestones, felsites, and diabase dykes, and the ore bodies were only superficial and would not extend down more than a few feet. The writer saw no reasons for adopting this theory.

Mr. Wm. M. Brewer, in an article in the *Engineering and Mining Journal* of February 1st, 1902, and also in a paper read before the Canadian Mining Institute in 1905, has given a very concise and clear description of the district and a number of the properties, drawing attention in particular to the striking resemblances between these deposits and those on Texada Island. Recent work in both places has further proved the similarity of the deposits in these two localities; and as those on Texada Island have improved from the surface to their present depths, there is every reason to believe that the Whitehorse deposits will do the same. For recent information regarding the Texada Island deposits the writer is indebted to Mr. O. E. LeRoy, of the Geological Survey, who examined them this last season.

The writer agrees with Mr. Brewer in regard to the Whitehorse deposits, except as regards their origin. Only a very casual examination was made this summer, but from what was seen in the field, and from examinations of specimens since, it seems almost certain that the felsite rocks in which the ore occurs are of secondary contact origin and not intrusives, and that the granites are directly the cause of the deposits and are connected gentically with them. A thin section of a typical specimen of the felsite shows it to be a mosaic of spinel with some pyroxene and to be clearly of secondary contact origin.

This season Byron N. White, of Spokane, has been working the Pueblo nearly all summer, and is still continuing, and when seen in October this property presented an enormous surface showing. A body of ore, approximately 225 feet by 250 feet, was uncovered, and a shaft had been sunk over 100 feet on it, and no walls had as yet been encountered. The ore on the Pueblo is hematite, strongly impregnated with the copper minerals, chalcopyrite, bornite, malachite, cuprite, and even some native copper. Aside from the copper values in the ore, the hematite itself will be valuable for fluxing, when smelting operations commence in this district. On most of the properties magnetite takes the place of the hematite. Ore is at present being shipped from the Pueblo to the Britannia smelter at Crofton, B.C.

The Carlisle shaft has been sunk over 115 feet, and 100 tons of ore were shipped from this property this summer. The Arctic Chief is working at present, and is reported to be steadily improving.

So in this district from the British Columbia and Yukon boundary to Whitehorse, a distance of approximately 100 miles, there are a variety of mineral deposits which extend over a considerable portion of the district, showing how widely mineralized this section is. Added to this is the fact that there is a fair amount of good available coal in the Yukon.

Just south of the Whitehorse copper deposits, and between them and Gold Hill, is a belt of anthracite coal which has been worked to some slight extent about 12 miles in a southwesterly direction from Dugdale on the W. P. & Y. Railway. The general strike of the measures is about true 74 degrees west. A 60 foot tunnel has been run in on one of the seams. Here the strike is true 63 degrees west, with a 42 degree dip to the northeast. Three seams were seen, being respectively 9 feet 6 inches, 10 feet 4 inches, and 2 feet 6 inches wide, and others may be covered by the heavy wash in the valley. The samples tested were surface samples, and consequently ran very high in ash. The coal should make a good fuel, and, as there is a good grade from the railway to the coal claims, and as the coal is close to the copper deposits, the Watson and Wheaton rivers deposits, and the town of Whitehorse, this coal should be of considerable value to the district.

Down the river from Whitehorse, about 190 miles, or somewhat less than half way to Dawson, is the Tantalus Coal Mine. As the coal outcrops here on the river banks, it is well situated to work economically. Most of the river steamers burn this coal, and about 7,000 tons will be loaded this season. There are three workable seams opened up, only the lower two of which are being worked at present. Other seams may be found, as the formation is heavily covered in most places. The coal is worked by the stall and pillar method from two tunnels, which were in about 700 feet

when visited in October. The wages paid was $5.00 per day, with board and lodging for underground and $4.00 for surface work. The measures are quite regular and can be traced over 20 miles down the Nordenskiol river to the south, and for over 10 miles to the north, showing that there is an enormous amount of coal in this district. When the measures have been prospected more closely it is hoped that they may be found in some accessible points much closer to Whitehorse, because, as the coal gives good coking results in the laboratory, it probably will make a metallurgical coke. In that case, a smelter seems a probability in the vicinity of Whitehorse, where there is the ore, flux, and the water power.

The following section was measured near the end of the tunnels at the Tantalus Mine:—

		Feet.	Inches.
	Coal	2	4
	Shale	0	7
Bottom seam	Coal	2	0
	Shale	0	8
	Coal	2	11
	Shale	4	0
	Coal	2	3
	Shale	0	2
	Coal	0	7
Middle seam	Shale	0	2
	Coal	2	0
	Shale	0	2
	Coal	1	8
	Shale	7	0
Top seam	Coal	3	0
	Shale		

Analyses of coal from these three seams are:—

Water	0.75	0.76	0.82
Volatile combustible matter	23.61	24.74	25.12
Fixed carbon	55.21	58.60	66.03
Ash	20.43	15.90	8.03
	100.00	100.00	100.00
Coke per cent	75.64	74.50	74.06

These coals yield in the laboratory a firm coherent coke.

This paper has been intended to give merely a general description of the different classes of mining in the Southern Yukon, rather than to give detailed descriptions of any particular locality, as quartz mining seems to be one of the permanent future industries of the district.

ASBESTOS IN FOREIGN COUNTRIES

By Fritz Cirkel, Mining Engineer, Montreal.

(*Continued from page 55*).

About ten years ago asbestos was discovered in what appeared to be payable quantities in West Griqualand. The asbestos had a peculiar blue color, caused by the large proportion of iron protoxide it contained. It created quite a sensation on the London market. It was generally found in veins seldom less than two and more often four and five inches wide, formed of closely compacted parallel fibres. The output during the year 1898 was, on an average, about 100 tons per month, and the prospects for an increase seemed at times very bright. Very little skilled labor was employed, the mining being mostly surface work, or by shallow adits run in the sides of the hills. The cost of extraction, even with the primitive mining methods employed, was about twenty-five dollars a ton. But with all these advantages the business connected with the mineral has not been prosperous. Although the blue Cape asbestos was claimed to be as good as or superior to the white Canadian asbestos for many special purposes, it was, nevertheless, found that the introduction of this mineral into the trade was not making the rapid progress that was looked for. In 1898 the sales amounted to £9,000. In 1901, according to official reports, the production sank to £1,600, and for 1902 no production was reported. This ended the whole asbestos industry, for the present anyway, in Cape Colony.

Recently, however, information has been received that asbestos has been discovered in the Transvaal in the Carolina District, and it is reported that several companies are already in the field. The extent of the asbestos area is said to be considerable. It is further asserted that the asbestos is of an excellent quality, and so the report goes—can be separated or cleaned without the aid of machinery. (!)

The asbestos occurs in serpentine, cutting a cherty formation with bands of manganiferous earth. The latter, on account of its loose condition, is likely to give considerable trouble in mining. The mode of working the asbestos on a large scale has not been decided upon. Mining and shipping, it is said, may cost as much as £20 per ton, and a profit of from £15 to £20 is anticipated, in view of the excellent market conditions. According to the statement of the miners, the only treatment necessary is "cobbing." This, it is believed, will not cost more than 10s. per ton. No expensive machinery is required. The nearest railway station is Wonderfontein, about fifty miles distant, but the new "Springs Eastward" line will bring the property within half that distance. Native labor is at present scarce. The Carolina asbestos is of abnormal width, according to experts' reports, and equal to the finest in the world.

There are now three companies in the field, viz., The Transvaal Asbestos Syndicate, now absorbed by the Consolidated Gold Fields; The South African Minerals Option Syndicate, a subsidiary of the Bechuanaland Exploration Company, and The Anglo-Swiss Asbestos Company. On one of the properties, that of the Consolidated Gold Fields, it is estimated that there are 150,000 tons of asbestos in sight. This property comprises the Diepgezet farm, in extent about 7,000 acres. Samples of the asbestos from this property were sent to England and America, and replies were received that a ready market existed for the class of material submitted. A ten-ton shipment of almost entirely outcrop stuff, was made to England, and £21 profit realized per long ton. An offer was made for the better class of stuff from Germany at £40 and from England at £45 per long ton.

The South African Minerals Option Syndicate owns the Victoria and Rietfontein farms, and on each of these asbestos has been discovered in several places. The Anglo-Swiss Company are working near Gooderwacht, and it is believed that the mine contains about 200,000 tons of asbestos of No. 1 quality. It must be mentioned that, in view of the small amount of work which has been done on this property, this statement cannot be taken seriously.

A REVIEW OF SOME RECENT SCHEMES FOR CLASSIFICATION OF COAL.

By A. L. MacCallum. Paper read before the Nova Scotia Mining Society.

The classes of coals recognized in this country are various. They depend largely on physical characteristics rather than upon chemical composition, and consequently they cannot be accurately defined.

The divisions into anthracite, semi-anthracite, and semi-bituminous, are fairly satisfactory, but the term bituminous embraces such a variety of coals that it is of little value, and the term lignite is so loosely applied that it has little or no place in a scientific classification.

This classification was based on the fuel ratio which was described as the quotient of the fixed carbon divided by the volatile matter. From this the following classification was adopted:—

Anthracite fuel ratio	100 to 12
Semi-anthracite fuel ratio	12 to 8
Semi-bituminous	8 to 5
Bituminous	5 to 0

The great advantage of this scheme over those previously used is that it is based on certain definite constituents of the coal, and these constiuents in a general way determine the fuel value of the coal, but when an attempt was made to apply this classification to the various coals of the United States it was found to be unsuitable.

By this classification the low grade coals of Iowa and Missouri would be in the same class as the best West Virginia and Pennsylvania coals. Also, there is no provision made for lignites.

In connection with the work done at the coal-testing plant of the United States Geological Survey at St. Louis, the following schemes of classifications were tried:—

I.—Fraser's fuel ratio as above, which proved unsatisfactory, especially in the low grade coals.

II.—*Fixed Carbon.*—This also proved unsatisfactory with low grade coals.

III.—*Calorific Value.*—This is better for low than for high grade coals, as in some cases bituminous coals have a higher calorific value than anthracite.

IV.—*Hydrogen.*—No satisfactory classification could be based on this.

V.—*Carbon.*—This proved fairly satisfactory, but in many cases it is impossible to distinguish between true bituminous coal and lignites.

VI.—*Carbon Hydrogen Ratio.*—These are the two chief fuel elements in coal. In the progressive development of brown lignite to anthracite, the carbon increases (or at least does not diminish), while the hydrogen decreases.

The quotient of the hydrogen into the carbon was found to be a very satisfactory basis for classification, yielding the following distinct classes:—

Group A—Graphite	0	= 0
B, C—Anthracite	30	= 26
D—Semi Anthracite	26	= 23
E—Semi Bituminous	23	= 20
F—Bituminous	20	= 17
G—Bituminous	17	= 14.4
H—Bituminous	14.4	= 12.5
I—Bituminous	12.5	= 11.2
J—Lignite	11.2	= 9.3
K—Peat	9.3	= 7.2
L—Wood	7.2	=

Quite recently this scheme has been rather sharply criticized by Professor Kerr. He suggests a new basis for classification, which seems to be extremely rational.

He bases his systems on two fundamental facts.

I.—The ratio of the total to volatile carbon.

II.—The amount of inert volatile matter.

The volatile matter in coal is often spoken of as volatile combustible matter, which is not absolutely correct, as there is a part which is not combustible, being, in fact, water formed from the oxygen and part of the hydrogen occurring in the coal.

This is the inert volatile matter. It is higher in the lower grade of coals.

The ratio involved is expressed by the formula VC x 100-C, in which VC is the volatile carbon and C the total carbon.

According to this scheme coals are classified as follows:—

Anthracite	$\frac{100}{VC}$ x	=	below 4
Semi Anthracite	"	=	" 4 to 8
Semi Bituminous	"	=	" 10 to 15
Bituminous A	$\frac{100}{VC}$ C =	20	= 32
	Inert Volatile	5	= 10%
Bituminous B	$\frac{100}{VC}$ C =	20	= 27
	Inert Volatile	10	= 15%
Bituminous C	$\frac{100}{VC}$ x C	32	= 44
	Inert Volatile	5	= 10%
Bituminous D	$\frac{100}{VC}$ x C	27	= 44
	Inert Volatile	10	= 15%
Black Lignites	$\frac{100}{VC}$ C	27%	up
	Inert Volatile	16	20
Brown Lignites	$\frac{100}{VC}$ C	24	= up
	Inert Volatile	20	= 30%

The values involved in this table are, of course, calculated from analytical data.

Taken altogether, I think this is the most satisfactory scheme that has yet been proposed. It gives some definite, tangible value to the terms anthracite, bituminous, etc. It is, in addition, based on strictly scientific principles.

I am glad to learn that our own Survey proposes to undertake with our own coals similar work to that which is being carried on at St. Louis. This cannot help being very beneficial if properly carried out. For one thing, it will bring more up-to-date the analytical data appearing in Government reports on coal. Possibly from data obtained they may propose a new and better scheme of classification.

CORRESPONDENCE

THE CANADIAN MINING JOURNAL, while it welcomes letters of criticism or correction, or of general interest, is not responsible for opinions expressed in this column.

To the Editor, CANADIAN MINING JOURNAL:

Dear Sir,—In your last issue, of April 15th, you publish an article on "Graphite in Canada" from the pen of your special correspondent. As one very deeply interested in the future of this industry, I beg to take exception to the article on account of its glaringly apparent intention to advertise certain properties and particular machines manufactured by some of the parties interested in them, and to the statement that it is "specially due to the untiring efforts of some enterprising Americans" that "lately great attention has been paid to Canadian deposits." The entire article is misleading, inasmuch as the reader is led to infer that all the activity in this mineral is confined to the operations of some Americans at the Diamond Graphite Company's works near Buckingham, and at the works of the Calumet Mining & Graphite Company at Calumet. Credit must, of course, be accorded these gentlemen, and is given freely by all of us, but not to the exclusion of a greater number of Canadians who have for years fought the prejudice so commonly held in the United States against our product. No mention is made in the article of the Globe Refining Company at Port Elmsley, the Ontario Graphite Company at Calabogie, the Allan Mine at Allanhurst, all in Ontario, nor of the Buckingham Graphite Company, of Buckingham, Que., nor of the Canada Paint Company, near St. John, N.B., all of which are owned and operated absolutely by Canadians. In addition to these, active work is being prosecuted at the Bell Mine, near Buckingham, by British capital. Your article states that as well as the Diamond Company's mill another is in course of construction. This is certainly news to Buckingham, and those interested in graphite here. Your correspondent is, let us hope, without malice in his mis-information regarding the Diamond Graphite Company. He says the property is "situated five miles north of Buckingham, on the left bank of the Gatineau." It is about six miles north of Buckingham on the right bank of the Lievre, in another county. He states that their graphite area has a triangular shape with certain dimensions, which figures would indicate an area of about two acres. As to his statements relating to the mill, I will take no exception, except to state that I am informed, on the best authority, that the information relating thereto is very inaccurate. The illustration which accompanies the article is labelled Black Lake, Quebec, a somewhat misleading title for a photograph of the Bell Mine in Buckingham Township.

The entire article is full of glaring mis-statements, and it is particularly unfortunate that such should be published at the present time, as every endeavor is now being made to put the industry on a better and more permanent basis. For years we, in Canada, have had to fight prejudice and old-established business connections, and we are only recently getting for our Canadian product the attention of the graphite trade of the world.

If I may criticize the arrangement of your reading matter, I would draw your attention to the fact that you published an editorial on "The Promoter," on page 66, instead of as an introduction to "Graphite in Canada," on page 79.

Yours truly, H. P. H. BRUMELL.

Buckingham, Que., April 22nd, 1907.

SPECIAL CORRESPONDENCE

Nova Scotia.

The long-drawn-out battle, which many surmised was a battle between Nova Scotia's two giant concerns, the Dominion Iron & Steel Company and the Dominion Coal Company, has at last ended. The contest continued over a period of four weeks. The amendments to the Mines Act are now law, but they are not the amendments originally introduced. They have been cut and carved and chopped in a remarkable manner. Both parties profess to be fairly satisfied, so those not directly interested can afford to refrain from criticism. The purpose of the amendments is to afford facilities to owners of submarine areas to obtain access to the same, by going through the lands of other lessees which may intervene. One of the novel features of the bill is that the damages allowed the owners of the intervening areas are not to be allotted by arbitrators, but by the Governor-in-Council. The reason given for this is that the valuation of arbitrators might be appealed from to the courts, and operations delayed for, possibly, five years. To a lay mind it seems peculiar that a clause could not be drafted making appeals and delays impossible. It is now in order for the Dominion Iron & Steel Company to show that they do indeed purpose going into coal mining by proceeding to make arrangements to work the submarine areas at Point Aconi, south side of Sydney Harbor. It is said that the Dominion Iron & Steel Company has met with success in their borings, for coal, at the head of Lingan Bay. About a half mile from the Lingan Beach, outside of the Bridgeport Basin, and adjoining the Dominion Coal Company's areas, a five foot six seam of coal has been discovered. The company has not officially given out the thickness of the seam, but it may turn out that the thickness given is not far wrong. Suppose the Steel Company sets to work on this at once, it will take years before they can produce, in considerable quantity, at Point Aconi, and eighteen months before they can produce in appreciable quantity from the land area, near the head of Lingan Bay.

A new company, that purposes to be a producer on a large scale by 1908, is the North Atlantic Collieries, Limited. The property of this company is situated in what is known as the Cow Bay Basin. The workings will be submarine. It is stated, with a marked degree of confidence, that the coal extends for an almost indefinite distance under the ocean. At first the company proposed to approach their areas from the south side, but as the land areas are held by a party who places their value at a fancy figure, this purpose was abandoned, and instead the company will operate from the north side, and in order to do this will acquire, if they have not already done so, the property of the Gowne and Blockhouse, Limited. The acquisition of this property puts them in possession of a working colliery, not at present a large producer, but which can be made, at a comparatively small expense, capable of producing a thousand tons per day, or 240,000 tons for the year 1908. As the workings underground develope the output will correspondingly increase, and 1909 would likely see an increase of fifty per cent. on the preceding year's output. This company has taken several years to perfect its plans, and therefore there is every reason to believe that the project will be highly successful. There are no fewer than seven seams of coal on the property, the combined thickness of which is thirty-four feet. Henry M. Whitney, of Boston; Geo. E. Drummond, of Montreal, and B. F. Pearson, of Halifax, have consented to become directors. The fact of these well-known men being on the directorate conveys the impression that soon there will be something doing.

Contrary to expectations, the shipments of coal for March do not compare favorably with last year. There are some increases, but the large decrease in shipments of the Dominion Coal Company wipes all of them out. There are several reasons for short shipments, viz., stormy weather, scarcity of cars, and stoppage of work by the workmen. In March Cape Breton had three big storms, which put almost everything out of business. The men of Dominion No. 1 stopped work in an effort to get a number of "outsiders" into the P. W. A. lodge. Having accomplished this, the men signified their readiness to go back to work, but the management told the men as they had stopped work of their own accord they could stop off a while longer, while some repairs were effected in the pit. It was thought that the example set by the men of Dominion No. 1 would be followed by the men of the collieries. The officials of the Coal Company gave intimation that if there were any more of these stoppages the company would discontinue collecting the lodge dues in the pay office. This intimation seems to have had the effect of deterring the men in further attempts after the "closed shop." The coal companies in Nova Scotia have no objections that their workmen should be union men, indeed, they might prefer that all would be such, but if they can prevent it they are determined there shall be no coercion. At the beginning of the month the men at Springhill stopped work until all the men should join the union. They were out four days. Their stoppage was in violation of the new industrial dispute bill. The men claim that they were led to believe that the Act did not apply to the mines of Nova Scotia. The Deputy Minister of Labor informed the men by telegraph that the law was operative in Nova Scotia, but this had seemingly no effect; the men stayed away from work until they had accomplished their purpose. The men are each of them liable to a penalty of from ten to twenty dollars. Proceedings for recovery of penalty are left to private individuals. Will anyone prosecute? Is the law to be a screaming farce?

The Dominion Coal Company are still busy prospecting on their Lingan and Victoria areas. Notwithstanding reports in the press to the contrary, no site for the proposed new colliery has been decided on, nor is a permanent slope being sunk. The company may be bothered from an embarassment of riches. In what is called the Lingan section, there are three known seams, while in the Victoria section no one is prepared to say what the number is. It is claimed by those having knowledge of the locality that there are no fewer than eight workable seams in the Victoria section. If this be so, no wonder the company is perplexed as to which seam to attack. It is possible that the much talked of Mullins seam may be the scene of future extensive operations.

It is believed that the Local Government will assist, pecuniarily, a committee of the Mining Society, appointed to procure information as to the extent and the quality of the fire clays of the Province. In selecting each year a mineral for special consideration, the Society is to be commended.

Cobalt.

A local branch of the Canadian Mining Institute has been formed with Mr. A. A. Cole, M.E., as chairman, and Mr. Geo. Hardy, secretary. There are about fifty members of the Institute residing in Cobalt, and much interest is manifested in the new branch.

Mr. "Nick" Flynn has been appointed manager of the La Rose Mining Company.

Prof. R. W. Brock, of Kingston School of Mining, was in Cobalt for a few days.

Capt. Harris, of the La Rose Mining Company, has resigned.

Mr. T. Herriman is the new manager of the Temiskaming Mining Company.

Mr. Neil McDonald has resigned from the managership of the Beaver, and is now superintending the work at the Prince Rupert and Cobalt Coalition Mining Company's property.

ALGOMA.

The Jury Mining Company, of Dean Lake, are steadily progressing with their development work and preparing for mining on an extensive scale during the summer. A shaft is being sunk on the vein and is now down to the depth of 20 feet, while the appearance of the ore to this depth is extremely satisfactory. A number of prospectors have recently arrived in the neighborhood, but owing to the late spring the snow is as yet too deep to allow of any systematic prospecting being done.

A find of cobalt bloom is reported to have been made in Morin Township, twenty miles north of Bruce Mines, by a farmer, who states that he has discovered a vein extending over a quarter of a mile. This discovery is interesting, inasmuch as it is the first evidence of the existence of this mineral in the neighborhood.

The owners of the Herminia Copper Mine at Massey intend at an early date to erect a smelter at Thessalon for the treatment of their ores.

EAST KOOTENAY.

The Crannbrook Firebrick & Terra Cotta Company, Limited, with a capital of $50,000, in $1 shares, has been incorporated. Among the objects of the company is the manufacture and sale of firebricks and fireclay products for metallurgical, building and other uses.

Preparations are being made for the ensuing season's placer gold mining on both Wild Horse and Perry Creeks, in Fort Steele mining division. On the former the Invicta, Nip and Tuck, and Brown-Larsen properties, among others, will be worked. The heavy snowfall of the 1906-7 winter promises an abundant supply of water for gravel-washing purposes.

An enlarged output of lead-silver ore at the Sullivan Group Company's mine is reported. One recent week's production was about 1,000 tons, which is stated to be an increase of 30 per cent. over the ordinary weekly output for some time past. The ore is all treated at the company's lead smelter at Marysville, a few miles from the mine.

WEST KOOTENAY.

Nelson.—Several mines in the Nelson mining division give promise of making a better showing in 1907 as regards ore production than they did in 1906. These are the Silver King and Eureka, both situated within a few miles of the town of Nelson; the Queen Victoria, a copper property near Beasley siding, about seven miles west of Nelson; the La Plata, formerly known as the Molly Gibson, on Kokanee Creek, east of Nelson; and the well-known Ymir gold mine, in the Ymir section of the division, now under new management and provided with ample funds for further development.

The Silver King is to be worked by the Hall Mining & Smelting Company on its own account, the partnership arrangement between the company and Mr. H. S. Davys having been cancelled. An understanding has been arrived at with the owners of the adjoining Dandy mineral claim, permitting the driving of a tunnel from the Dandy into the Silver King mine, to connect with the workings of the latter at a depth that will drain the mine down to the seventh level without incurring the constant expense of pumping. All ore of payable grade accessible above that level will thereafter be mined and shipped to the smelter.

The Queen Victoria made its first shipments in March, in which month it sent about 400 tons of copper-silver ore of fairly good grade to the smelter at Trail. It is expected that the output for April will be about 1,000 tons, and that production will be gradually increased in later months. The ore is being broken down from a big bluff of mineralized rock, and is roughly sorted before shipment. Mr. N. J. Cavanaugh, formerly at the Slocan Star mine, is in charge of operations, in which 22 men are employed.

Ainsworth.—At the Krao mine the shaft has been deepened to 200 feet, and sinking is being continued, the intention being to go down to the 300 foot level. A station is being cut at the 200 foot level. Further development work is to be done on the 100 foot level, and drifting and cross-cutting at both 200 and 300 foot depth will be undertaken as soon as practicable. Some 20 men are employed at the mine, the work in which is being done under the supervision of Mr. W. E. Zwicky, manager of the Rambler-Cariboo mine in Slocan district.

The long tunnel in the Highlander mine is being extended, Mr. Geo. H. Barnhart, several years ago manager of the Ymir mine, having a contract for driving another 1,000 feet. Mr. Barnhart is also operating the Libby, Spokane and Glengarry properties, all in Ainsworth camp. Mining work in this camp will be much expedited and costs reduced should the owners of the Taylor hydraulic air compressor, installed in a neighboring creek in 1900 by the Kootenay Air Supply Company, Limited, again supply the mines with power. The first drill ever operated by compressed air under the Taylor patents was started in one of the Ainsworth camp mines in April, 1900. The revival of interest in local mines which has taken place during the last year will probably lead to this compressed air supply system being utilized to a greater extent than in former years when previously in operation.

Slocan.—Connection has at last been made between the old workings and the deep level tunnel of the Rambler-Cariboo mine in McGuigan basin. This striking achievement constitutes what is believed to be the most important mine development work ever done in the district. Work on this tunnel was commenced on July 9th, 1904 and continued until May, 1906, an adit having meanwhile been driven 4,600 feet straight into the mountain at a depth of 1,400 feet below the collar of the shaft and 600 feet under the lowest level of the old workings, the heavy cost of keeping which free from water having led to the undertaking of the extensive development work now completed. The face of the tunnel not having reached the vein at the distance above mentioned, it was decided to put up a raise; this entered the vein at 150 feet. Thence up to the bottom of the old shaft the raise was made large enough for after use as a three-compartment main working shaft (12 feet x 4 feet 6 inches in the clear). When this raise was within 17 feet of the 200 foot level above, a drill hole was put through and the large quantity of water filling the old workings up to the 450 foot level drained off through the new tunnel at practically no expense. The raise was then carried through and now the old mine is being cleaned up preparatory to stoping ore of which there was known to be enough to pay the large cost of the adit and raise, leaving out of consideration additional ore that might reasonably be expected to be made accessible by the new workings. Mr. Zwicky, manager of the mine, on whose strong representations this big work was undertaken, has been freely congratulated upon its successful completion. Immediately the roads are in a condition that will admit of hauling to the railway, the shipment of ore will be resumed. Prior to the stoppage of work in the old mine nearly $1,000,000 worth of ore had been shipped from it.

Rossland.—The output of ore from Rossland mines for the first quarter of the current year was rather above 62,000 tons. The Rossland Miner has published the following tonnage figures to March 30th:—

Mine.	Tons.
Le Roi	33,551
Centre Star Group	19,842
Le Roi No. 2	4,890
Le Roi No. 2 (concentrated)	2,320
White Bear	255
White Bear (concentrated)	1,200
Total	62,058

The work of sinking the Le Roi main four-compartment shaft below the 1,350 foot level, commenced several months since, is progressing satisfactorily. A depth of 1,650 feet was reached by the end of March, and the contractors were using all expedition in continuing to a deeper level.

The Le Roi Mining Company is operating the Spitzee mine under a working bond with right of purchase. This mine had been idle since 1905, the local company owning it having had no money to pay for further development work. About 6,700 tons of ore in all have been shipped by the Spitzee Mines, Limited.

The 650 horse-power Westinghouse induction motor, installed in the power house of the Consolidated Mining & Smelting Company of Canada's Centre Star mine, to furnish motive power to the 40-drill air compressor instead of steam, was started on April 6th and found to run smoothly. An electric locomotive is now in use at the 350 foot level of the mine, hauling from the War Eagle to the Centre Star main shaft. Goor progress is being made with the installation of the new hoist—a Nordberg engine, cylinders 28 by 60 inches, drums 10 feet, skips 4 1-2 tons—to have a hoisting capacity of 1,350 tons per 10 hours from a depth of 3,000 feet.

BOUNDARY.

The Phœnix Pioneer has published the following ore production statistics for the quarter ended March 31st:—

Month.	Tons.
January	60,003
February	53,965
March	100,219
Total	214,187

The unusual severity of the weather experienced in January and March, and the shortage of railway cars for hauling ore and coke, together with the lack of sufficient fuel for mines and smelters, were accountable for the comparatively small production.

The treatment capacity of the Granby Company's smelter at Grand Forks is now at the maximum the enlargement of its six smaller furnaces was intended to reach. With eight blast furnaces, each having a capacity of about 500 tons per diem, the works are equipped for a larger output of copper than at any previous time since they were established. Should no difficulty arise in connection with labor and fuel supplies, the Granby Company should have a period of renewed profitable operations, mines and smelting works together being equipped for 100,000 to 120,000 tons of ore per month.

At the British Columbia Copper Company's smelter, Greenwood, the third large blast furnace has been completed. Although having a nominal capacity of 600 tons per day, it has been found that the new furnaces will each treat about 700 tons in 24 hours, so that the capacity of the works is fully 2,000 tons of ore per day. At the company's several mines good progress continues to be made. Several levels down to the 400-foot are being extended in the Mother Lode mine. The the Emma, electricity is being supplied for power purposes, the transmission of 40,000 volts from Bomington Falls generating station to the Boundary giving ample power for both mines and smelters of the district. Mr. J. E. McAllister, general manager of the company, has returned from his trip to Europe, his health having been greatly benefitted by the change and rest. Mr. G. F. Beardsley, on the eve of his retiring from temporary charge as acting manager, received from the smelter employees a serviceable gift as a memento of the good feeling existing towards him. Mr. Frederic Keffer, engineer in charge of the company's mines, is also back at his post, after having visited New York at the close of the annual meeting of the Canadian Mining Institute, held early in March.

The Dominion Copper Company is further increasing the equipment of its mines in Phœnix camp. At its smelting works at Boundary Falls the erection of the large blast furnace—the largest copper smelting furnace in Canada—is well forward. The addition of this furnace increases the smelting capacity of these works to between 1,400 and 1,500 tons per day. Mr. Thos. R. Drummond, the company's general manager, has gone to Cobalt in the capacity of assistant general manager of the Nipissing Company's mines. His place in the Boundary has been filled, it is stated, by the appointment of Mr. W. C. Thomas to the charge of the Dominion Copper Company's mines as well as its smelter, of which latter he has been in charge since the inception of operations under the present regime.

GENERAL MINING NEWS

British Columbia.

The Cariboo-McKinney Mine is being unwatered, preparatory to the resumption of mining operations.

A total of eight furnaces will soon be in blast at the plant of the Granby Consolidated.

In the Ainsworth camp mining is reviving briskly. The Krao main shaft is down 200 feet, and all the workings are reported in good ore.

The Boundary Falls smelter employees, by a new wage scale, will get about $1,000 more per month than hitherto.

The chief demands of the Western coal miners are: A wage increase of 10 per cent. all around; fortnightly pay. Bank-to-bank eight-hour day for Alberta.

It is probable that a Canadian Mine Workers' Organization will be formed, which will be entirely distinct from the United Mine Workers of the United States.

Large additions are being made to the plant of the Vancouver Portland Cement Company in Tod Inlet, B.C.

At a mass meeting of the miners of Coal Creek and Fernie, held at Fernie on April 11th, it was decided by a referendum vote of 741 to 42 to stop work unless the operators conceded there demands.

At the Cariboo-McKinney, unwatering has been carried on to the 400-foot level.

The smelter of the Dominion Copper Company established a new week's record. For the week ending April 13th it smelted 5,344 tons of ore.

Ontario—Cobalt.

The Government has decided to create two new mining divisions. These will be known as the Lady Evelyn Lake and Montreal River district, and the Larder Lake district. Recording offices will be established in each.

The International Coal & Coke Company, of Coleman, Alberta, has declared its second oneper cent. dividend, amounting to about $28,000, payable May 1st.

New Brunswick.

A man named Luunder Crossman was killed at the Intercolonial Copper Mines, Dorchester, N.S., by a premature explosion of dynamite.

Nova Scotia.

Torbrook.—The Leckie vein, to recover which systematic prospecting has been carried on for some time by Mr. W. F. C. Parsons, the mining engineer of the Londonderry Iron & Mining Company, was uncovered early in April at a point about 2,200 feet west of the Wheelock shaft. The vein here was 6 1-2 feet wide. It has since been traced east and west of No. 1 pit for a distanc of over one-quarter of a mile. The average width of vein on surface is 6 feet of clean ore between walls. The dip is about 80 degrees. The following is an analysis of an average sample, taken from half a dozen test pits:—Iron, 54.06 per cent.; silica, 13.10 per cent.; phosphorus, 0.86 per cent.; manganese, 0.14 per cent.; sulphur, 0.12 per cent.; alumina, 4.42 per cent.; lime, 1.86 per cent.; magnesia, 0.32 per cent. Assuming that this vein continues to the depth of the present workings, this already proved ground will yield 800,000 tons of ore. The ore can be put on cars at the mine for 75 cents per ton.

Over 4,000 tons of coal was raised in one day, April 12th, at the Reserve Mines Colliery, N.S.

The Dominion Coal Company will this season have the largest fleet of steamers that they have even put into commission. Their total carrying capacity is 106,650 tons.

MEN AND MATTERS

Capt. T. H. Trethewey has retired from the management of The La Plata Mines, B.C. He will remain on the board, however; therefore the company will not be entirely without his services. The Captain has other mining interests that require his personal attention. He has been succeeded by his son, W. J., who assumed charge April 1st. The mine is producing and making regular shipments to the Trail smelter.

Mr. Ralph Stokes, late mining editor of *The Rand Daily Mail*, Johannesburg, is now commencing a tour of the chief mining fields of Canada as the special correspondent of *The Mining World*, Chicago, and *Rand Daily Mail*, Johannesburg, and as an occasional contributor to the London *Financial Times*. His journey will comprise the last section of an extensive tour through the British Empire. Leaving the Rand in January last year, Mr. Stokes has since visited and reported upon the Ceylon (gems and graphite), Indian (mica and manganese), Malay States (tin), Kalgoorlie (gold), Broken Hill (silver, lead, zinc), Bendigo (gold), Mt. Lyell (copper), Tasmanian gold, Mt. Bischoff, Briseis, Anchor, etc. (tin), Zeehan (silver, lead), and Waihi, New Zeland (gold) mining districts. His Canadian journey will include the Rossland, Trail, Sudbury, Cobalt and Thetford fields.

Mr. W. C. Thomas, smelter superintendent of the Dominion Copper Company, has been promoted to the position of general local manager of the company. Mr. Thomas will have charge of both the smelting and the mining operations.

The citizens of Parry Sound have passed a by-law authorizing the giving of a bonus of $100,000 to the Dominion Smelters Limited, to assist in the erection of a $1,500,000 custom smelter. The smelter will have a capacity of 1,000 tons of ore daily.

Mr. Fritz Cirkel, mining engineer, of Montreal, is at present in the asbestos region of the Eastern Townships of Quebec, examining a large tract of recently discovered asbestos ground on behalf of Qeubec capitalists.

Mr. R. R. Hedley, for many years smelter manager of the Holt Mining & Smelting Company at Nelson, B.C., and who recently resigned that post, is at present visiting Montreal and other Eastern cities, renewing old acquaintances formed during his connection with the Orford Copper Company, some twenty years ago.

Dr. A. E. Barlow returned to Ottawa on the 12th inst., after spending a very enjoyable two months on business and pleasure in Europe.

Mr. W. Stanley Lecky, head of Messrs. Mussens Limited mining department, was married on the 3rd inst. to Miss Mary Theresa Perram, of Buffalo, N.Y. Mr. and Mrs. Lecky are spending their honeymoon in England.

Mr. R. A. Daly, who for some years past has been engaged in the survey of the international boundary, along the 49th parallel in Southern British Columbia, in connection with the work of the Geological Survey and the Boundary Commission, has resigned his post and accepted a chair of Geology at Harvard University. Mr. Daly will reside at Cambridge, Mass., in future.

The Cobalt Townsite Company which owns thirty-seven acres directly south of Cobalt, made its first shipment early in April. A six-drill compressor is running on this property.

The Jury Copper Mines, Limited, recently installed a boiler and hoist upon the copper property which they are developing.

The Herminia Copper Mining Company, near Massey Station, are reported to be considering the erection of a copper smelter at Thessalon.

The Ontario Government has received a cheque for about $40,000, being part payment of royalty from the O'Brien mine on nine car loads of ore shipped during the first three months of this year.

Port Arthur.—The prospects of opening up several of the famous old silver mines of this district are good. The West End Silver Mountain is reported to be in satisfactory operation. The Beaver, the Badger, the Porcupine, the Rabbit Mountain, and the Shuniah Wickean or East End Mine, it is stated, will all be reopened. We hope and believe that this will mark an era of added prosperity in Western Ontario.

On or about the first of May the Atikokan mines will commence shipping iron ore to the Port Arthur blast furnace. It is expected that 200 tons per day will be shipped.

It is expected that 100,000 tons of ore will be shipped from the Loon Lake iron mines this season. They have been purchased by the Canadian Bessemer Ore Company. The ore is to be crushed and put over Hancock jigs for concentration.

The merger of La Rose, University and several other mines is reported. Messrs. John W. Martin, Timmins and Dunlop are behind the new promotion. It is announced that the capitalization will be $6,000,000. The new company will take the name of La Rose.

An official report announces that at a depth of 75 feet an eight inch vein of smaltite has been struck in the Foster workings. This is decidedly encouraging. Superintendent Alder is to be congratulated.

Under the recent decision of the Supreme Court, which settles the litigation over the Lawson Mine, Mr. John McMartin becomes owner of three-quarters of the mine. Messrs. Millar and Clarke and their associates get one-quarter.

ALBERTA.

On April 3rd an explosion of gas in the mines of the International Coal & Cofle Company, Coleman, resulted in the death of three men.

Mr. A. B. Willmott has resigned his position with the Lake Superior Corporation and is taking up private practice. He will continue to act as consulting geologist for the above company, and will establish in Sault Ste. Marie, Ont. As a mining geologist, Mr. Willmott has had a long and valuable experience, and has done much towards the development of New Ontario.

Mr. A. A. Hayward, past president of the Nova Scotia Mining Society, is in Toronto. Mr. Hayward is a gold miner of prominence in Nova Scotia. During his term of office as president he infused new life into the Mining Society.

DIVIDENDS

The Consolidated Mining and Smelting Co. of Canada, Limited
Dividend No. 5

Notice is given that a dividend of two and one-half per cent. (2 1-2 per cent.) on the paid-up capital stock of the company for the quarter ending March 31st, 1907, has been declared, payable May 1st, 1907, to holders of full shares of the said company of record on the 22nd day of April instant.

Buffalo, Cobalt—Capital, $1,000,000; last dividend paid April 1st, 1907, $30,000.

Granby Consolidated, B.C.—Capital, $15,000; last dividend paid, March 30th, 1907, $405,000.

McKinley-Darragh, Cobalt—Capital, $2,500,000; last dividend paid, March 1st, 1907, $50,000.

Nipissing, Cobalt—Capital, $6,000,000; last dividend paid, April 20th, 1907, $180,000.

Trethewey, Cobalt—Capital, $1,000,000; last dividend paid, March 31st, 1907, $40,000.

International Nickel—Capital, $12,000,000; last dividend paid, May 1st, 1907, $121,123.

Nova Scotia Steel & Coal—Last dividend paid, April 15th, 1907, $74,555.

The limestones near St. John, N.B., are in places highly serpentinous and have furnished indications of the presence of Eozöon. At Pisarinco, however, serpentine is seen to cut talcose and chloritic rocks, associated with limestones, as a true dyke six feet wide. At the falls of the St. John River, also, deposits of plumbago of large extent are found in the slates and limestones.

BOOK REVIEWS

"Hydro-Metallurgy of Silver," by Ottokar Hofmann, Hill publishing Company, New York and London, 1907, $4.00, postpaid.

Mr. Hofmann's long experience in this branch of metallurgy has amply qualified him to produce an authoritative text-book. Mr. Hofmann was the first to introduce the process of lixiviation with sodium hyposulphite in Mexico (1868). Experience gained with different ores induced him to modify the chloridizing roast with the object of decreasing the loss of silver by volatilization. This was a marked improvement in the treatment of silver ores.

The book is divided into two sections; the first takes up "Chloridizing Roasting of Silver Ores"; the second deals with the "Extraction of the Silver."

There is a popular dictum that a text-book is usually ten years behind modern practice. Mr. Hofmann's book gives the lie to this. "Hydro-Metallurgy of Silver" is well compiled, well illustrated and well printed, and gives us the last word in metallurgical progress.

"The Principles of Copper Smelting," by Edward Dyer Peters, Professor of Metallurgy Harvard University. Pages, 612. Price, $5.00, postpaid. The Hill Publishing Company, 505 Pearl street, New York.

This new book of Professor Peters' is to be distinguished from his standard work on "Modern Copper Smelting." The latter book deals with the methods of smelting, the former is a lucid, exhaustive and reliable exposition of the principles underlying the actual operation. "The book is written, in part, for students," says Professor Peters in his preface, "and, as there are many persons who would like to gain some insight into the smelting of copper, but who have not the training which is requisite for the understanding of ordinary metallurgical treatises, I have tried to write in such a manner that it might be reasonably intelligible to those who have no exact knowledge of chemistry."

In this aim the author has succeeded. The book is clearly written. In style it is clear. In diction it is neither cumbrous nor hyper-technical; and this can be predicated of very few text-books dealing with such subjects. The arrangement is logical. Chapter VIII., on Pyrite Smelting, and Chapter IX., on Slags, are particularly valuable. That our praise may be slightly diluted by the cold water of criticism, we may suggest that a larger number of diagrams and illustrations would not detract from the appearance of the volume. This, however, is incidental. Professor Peters' new book is worthy of immediate adoption by educationists and technical workers. Would that some equally well-equipped writer would give us as full a treatise on the principles of modern iron smelting.

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Molybdenite ore, 95 per cent. pure—21 cents per lb.
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Pyrite, 38 per cent. to 45 per cent. sulphur—11 cents per lb.
Quicksilver—$42 per flask of 75 lbs.
Talc—$17.00 per ton.
Tungsten, pure metal—$1.32 per lb.
Tungsten ore, 60 per cent. pure—$400 per ton.
Tin—40 3-4 cents per lb.
Zinc sheets—$8.60 per 100 lbs.

ENGLISH ORES AND METALS MARKET

Compiled from James Lewis & Son's Monthly Report.

Copper—Standard, per ton, £97; best selected ingots, per ton, £109; ore, per unit (20 cwts.), 19s.

Silver has fallen from 32 1-6d. to 30 1-2d. per ounce; standard.

Quicksilver—£7 per bottle.

Lead is steady at £19 10s. to £19 15s. for English.

Antimony is steady, £98 to £100 per ton.

Nickel—1s. 9d. to 2s. per lb. net.

Cobalt, refined—9s. 9d. per lb.

Tin falls to £185 10s. cash per ton.

Bank rate of discount remains at 5 per cent.

EXCHANGES

The Mining World, April 13th, continues Horace Evans' "Explorations in British Columbia." "Endless Rope Haulage" is an excellent article.

"The Mines of the Fairview District, Nevada," are well described in The Eng. and Min. Journal, of April 13th.

The Mining Reporter, April 11th, contains a profitable epitome of chemical literature.

"Gas, Gas Engines, and Gas Producers," is a leading article in The Canadian Electrical News for April.

Cana, for April 6th, has been received. It devotes a page to mining matters.

The Mining and Scientific Press, of April 6th, has a very brisk editorial on "Salting Samples." The third installment of "How the Miner's Dynamite is Made" is eminently worthy of perusal.

South African Mines, March 16th, affords its usual comprehensive summary of mining operations in the Rand, Rhodesia, and other South African mining countries.

In the Journal of the Chemical, Metallurgical and Mining Society of South Africa for February, Dr. James Moir deals somewhat severely with The London Mining Journal. Discussion following the reading of a paper on "Witwatersrand Mine Air" leads to a lively embroglio between Dr. Muir and The Mining Journal—pre-eminently not "*sans phrase.*" Dr. Moir, in terms by no means tender, states that our estimable contemporary is not up-to-date in its technical information.

The Mining Investor, April 15th, compliments the United States Post-office Department upon its good work in suppressing fraudulent mining promotions. It also reprints the abstract of Professor Van Hise's paper on "Cobalt," which appeared in a recent number of THE CANADIAN MINING JOURNAL.

A statistical summary of "The British Open-Hearth Steel Industry in 1906" is given in the April 5th number of The Iron and Coal Trades Review.

In The Mining Journal London, an account of the Royal School of Mines' thirty-fourth annual dinner of old students is illustrated by a full page photogravure. The "Report of the Commission on Gold Stealing in Western Australia" is the subject of the leading editorial.

The Engineering Journal of Canada, April, has been received.

The Colliery Guardian, April 5th, continues "Evidence Taken before the Royal Commission on Mines."

Stone, for April, has been received.

In The Engineering and Mining Journal, April 13th, an electric winding plant at a German colliery is described. A portrait and biographical sketch of Mr. George Otis Smith, the new Director of the United States Geological Survey appears also in this number.

The Mining World, April 20th, gives a very readable account of the "Eocene Gold-bearing Gravels of Colombia."

CATALOGUES AND OTHER PUBLICATIONS

Portable oil well rigs, for drilling deep oil, gas and water wells, are described in a large catalogue (No. 3, 1907, second edition), sent out by the Keystone Driller Company, Beaver Falls, Pa.

Catalogue No. 2, "The Samson Crusher," 1734 Fifteenth street, Denver, Col., illustrates the Samson crusher. This is a uniform crushing type, which will not choke, and is economical of power. From the same address comes a circular giving a description of the Ajax Drill Sharpener, which sharpens 1,200 drills in 24 hours.

The February number of Mine and Quarry has been received. This is a very attractive quarterly bulletin, issued by the Sullivan Machinery Company, Railway Exchange Building, Chicago. The bulletin is published in magazine form, is well illustrated and gives information that is of real value.

A catalogue of coal mining machinery, sent out by the Morgan-Garner Electric Company, of 27th street and Shields avenue, Chicago, gives illustrations of their electric coal cutters, drills, generators, locomotives, etc.

Conveying and Transmission is a monthly publication devoted to methods for the mechanical handling of materials and transmission of power, published by Stephens-Adamson Manufacturing Company, Aurora, Ill. Canadian sales agents, Mussens Limited, Montreal.

From Fried Krupp, Grusonwerk, Magdeburg-Buckau, comes the announcement that a separate metallurgical department has been established at their works for the manufacturing of furnaces, machines and apparatus, as well as complete installations for the recovering of metals from ores and for the designing of plants for metallurgical treatment of lead and zinc dust, waste products, and for the concentration of refractory ores.

We acknowledge receipt of Circulars No. 1028 and No. 1067 from the Canadian Westinghouse Company, Limited. They deal with rotary converters and air blast transformers, respectively.

The "Carbogen" Oil Fuel Burner, manufactured by J. A. Curle, Limited, Homer-road, South Hackney, England, is designed to consume cheap and crude by-products and ordinary heavy oil. The "Carbogen" is lighted with extreme ease, and is an extraordinarily efficient steam raiser. For a full description we would refer our readers to The Engineer of February 15th, 1907. Mr. F. Sturgeon, 32 Church street, Toronto, is the sole agent for Canada. Mr. Sturgeon is also agent for the Anglo-Swedish Steel Company's mining and tool steels.

STATISTICS AND RETURNS

Shipments of ore in various British Columbia mining districts for the week end April 13th were as follows:—

	Tons.
Boundary	29,252
Rossland	4,204
Kootenay-Slocan	2,474
Total	36,530

The smelter receipts for the same period are:—

	Tons.
Granby	17,840
British Columbia Copper Company	5,911
Dominion Copper Company	5,344
Trail smelter	4,790
Hall Mines smelter	138
Le Roi smelter	1,467
Marysville smelter	600
Total	36,090

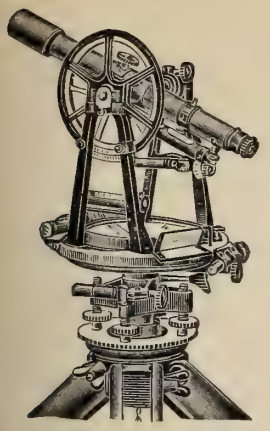
Cobalt Ore Statement,—Week Ending April 13th, 1907

Kerr Lake shipped 40,000 lbs. to Perth Amboy on April 8th.
Coniagas shipped 42,520 lbs. to Perth Amboy on April 10th.
Coniagas shipped 57,140 lbs. to Copper Cliff on April 10th.
O'Brien shipped 66,000 lbs. to Copper Cliff on April 13th.
Total—245,660 lbs.

The ore shipments through Kaslo for March show a big increase over the previous month and a large gain over the corresponding period of last year. Thirty-four car loads, totalling 632 tons, were shipped during March, against 156 in February. For the corresponding period of last year 401 tons, a gain of 231. This includes silver-lead, carbonates and zinc. The principal shippers were the Whitewater Deep and the Last Chance, as the following table will show:

	Tons.
Last Chance, silver-lead	104
Last Chance, zinc	27
Colonial, carbonates	49
Sunset, silver-lead	43
Whitewater, silver-lead	54
Whitewater Deep, silver-lead	143
Whitewater Deep, zinc	192
Bismarck, carbonates	20
Total tons	632

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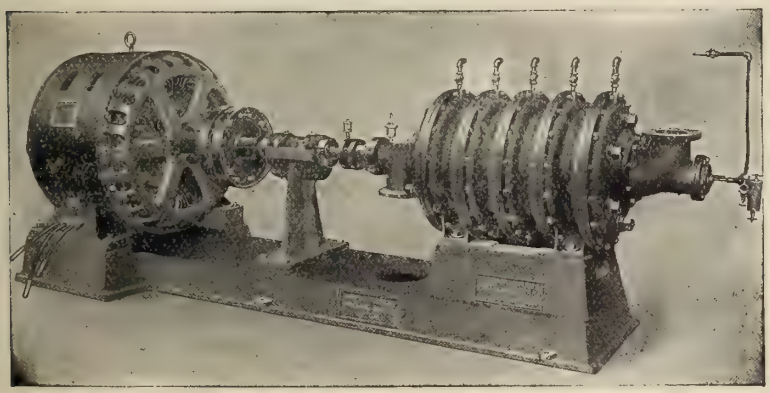
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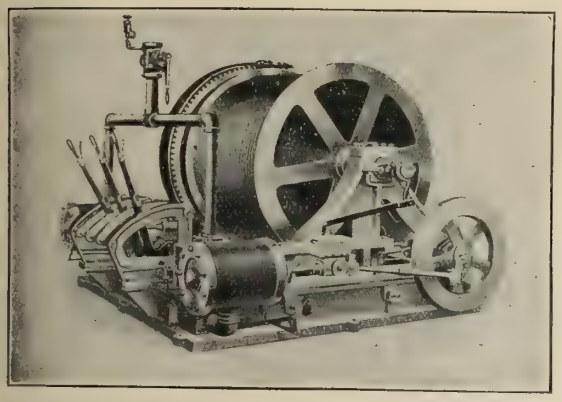
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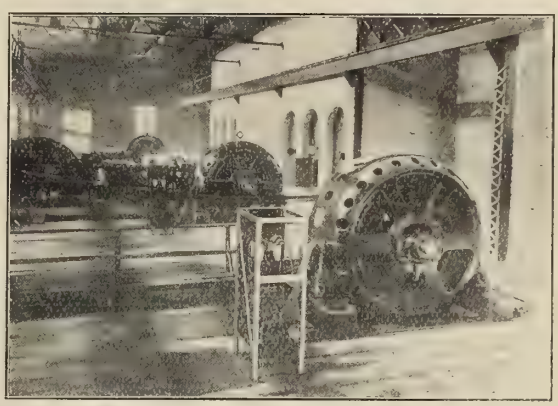
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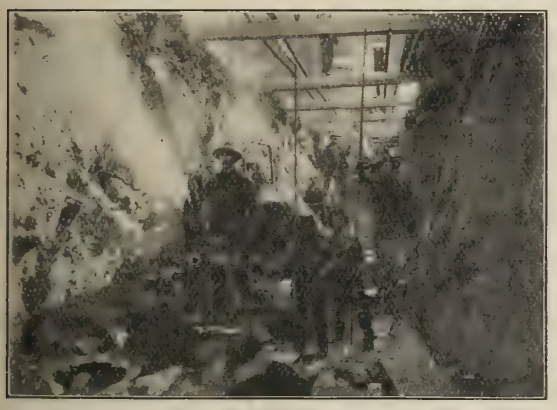
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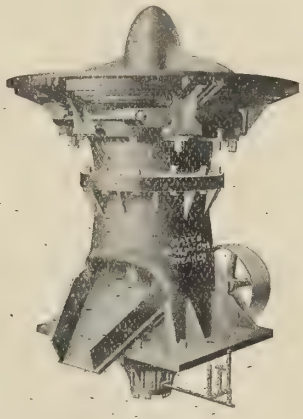
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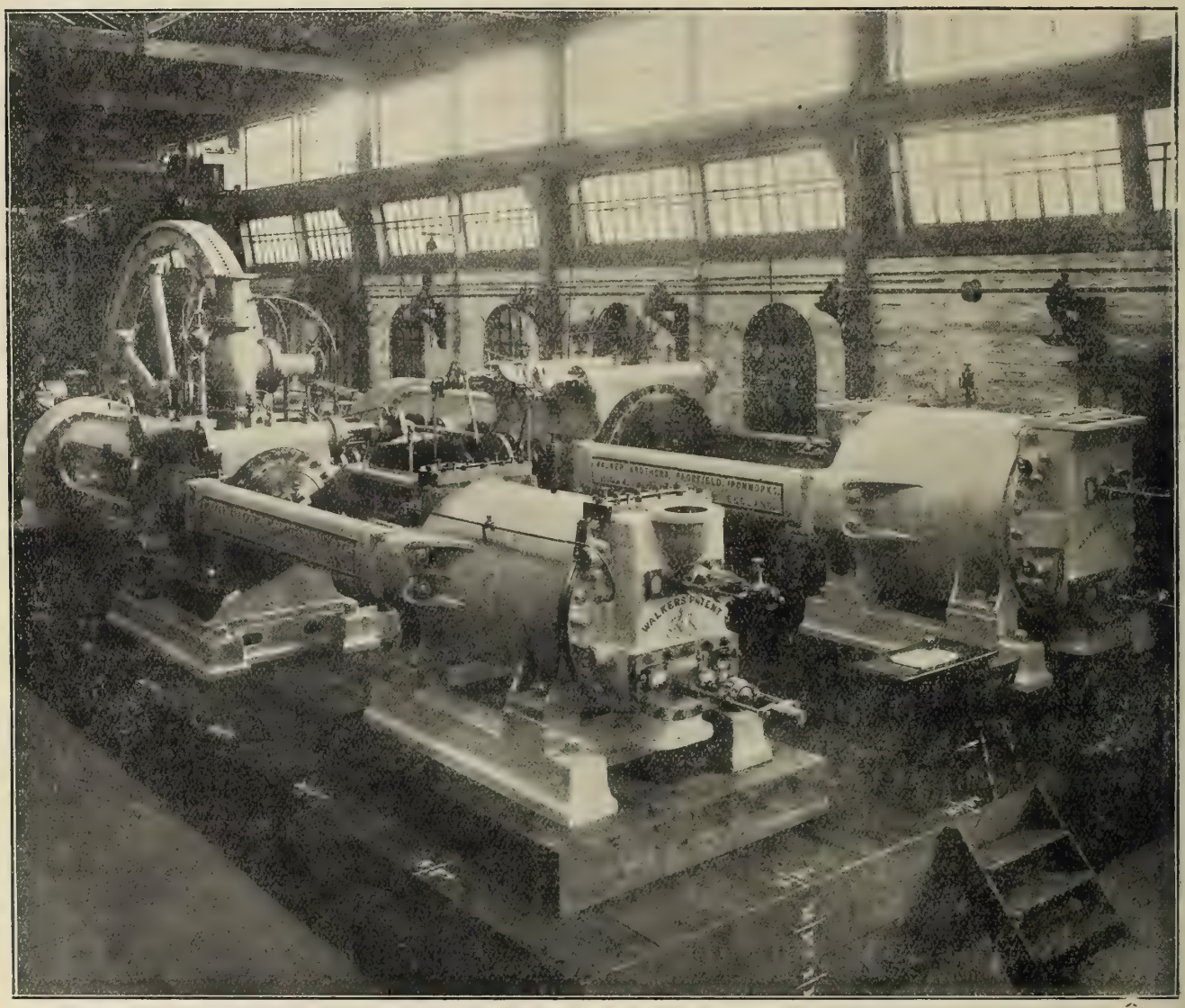
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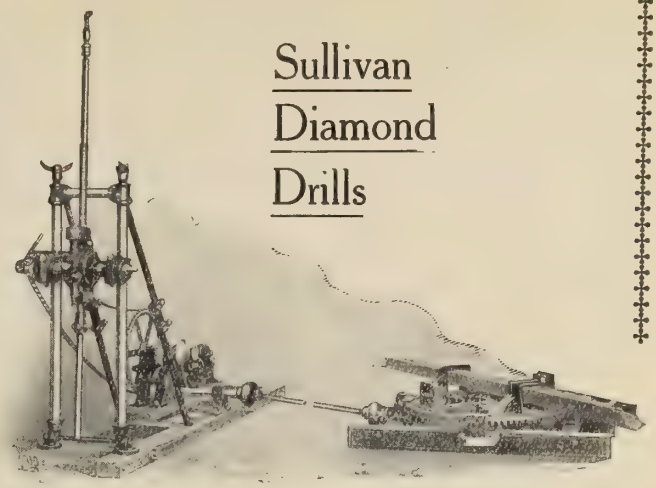
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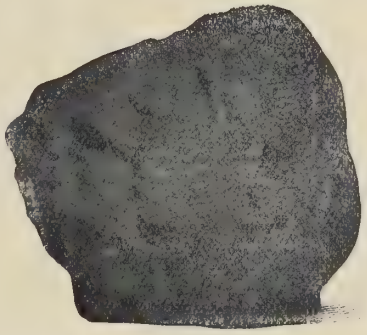
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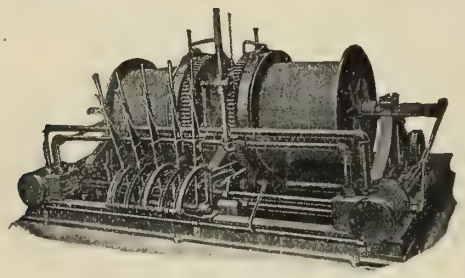
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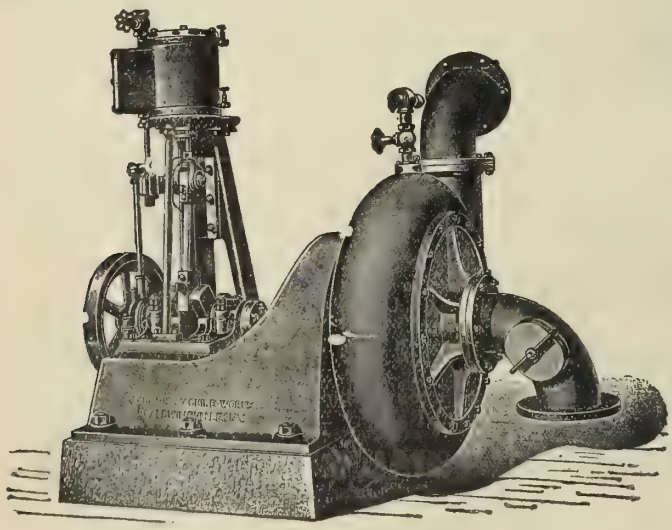
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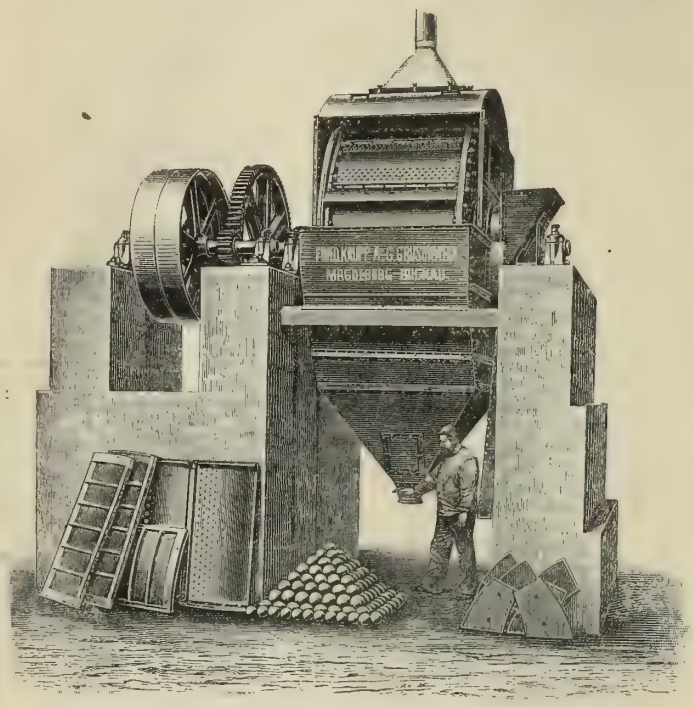
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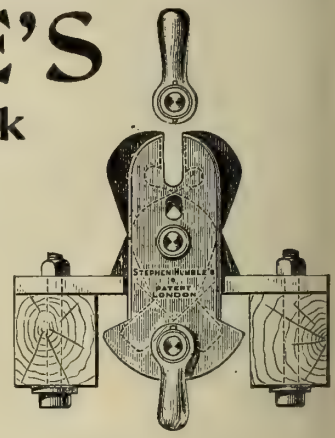
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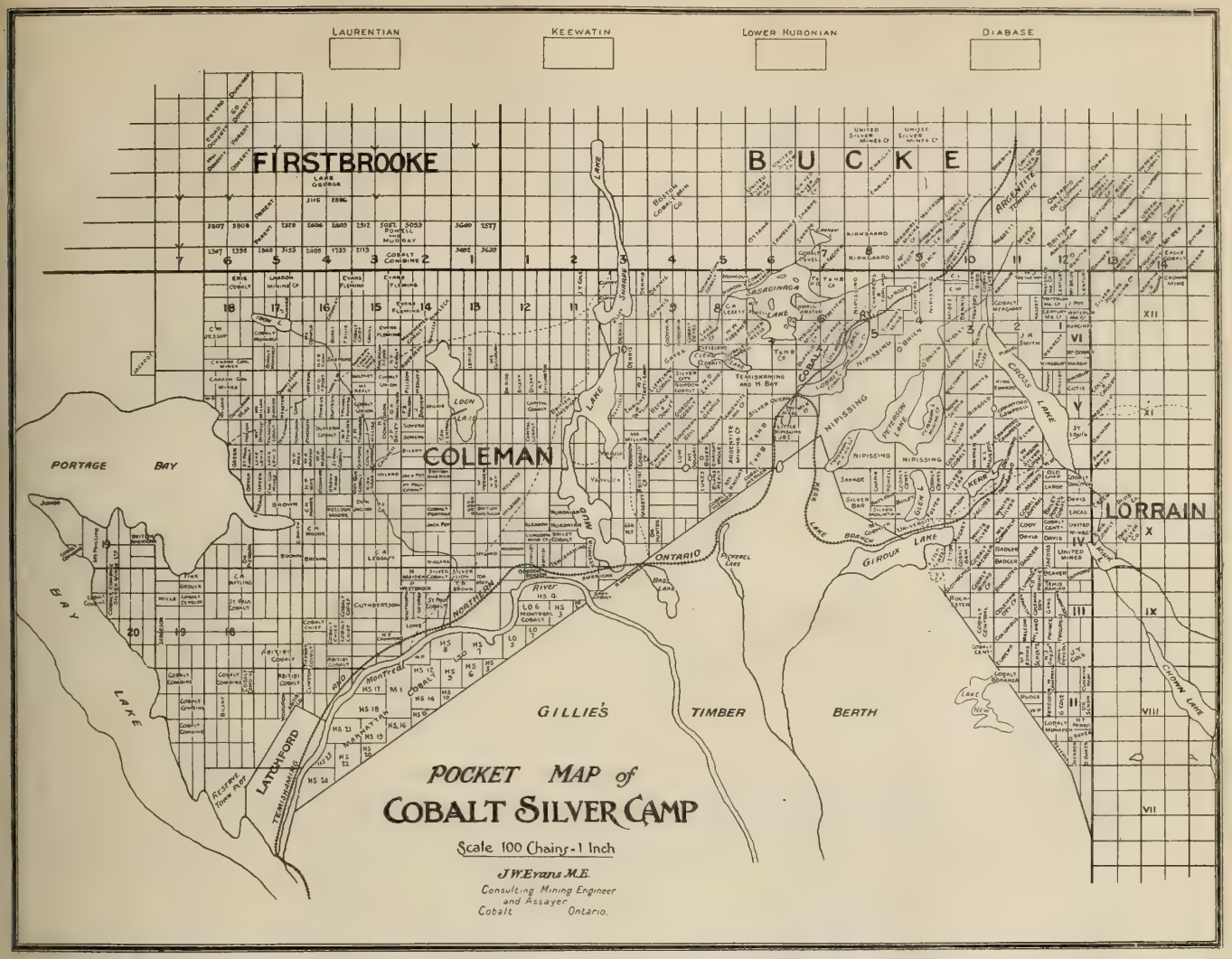
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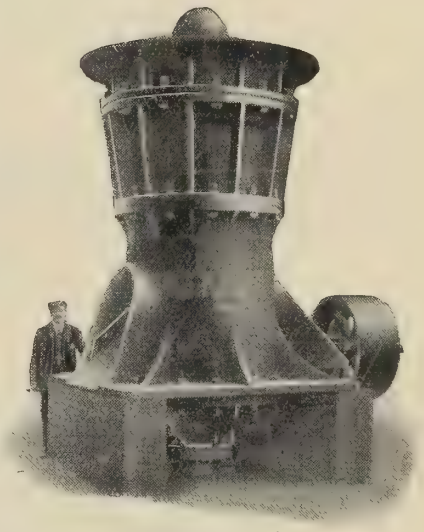
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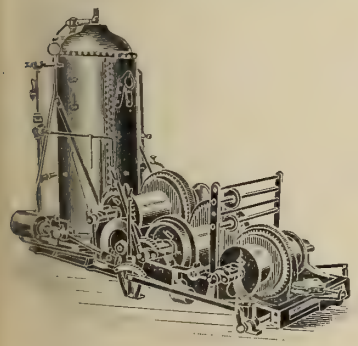
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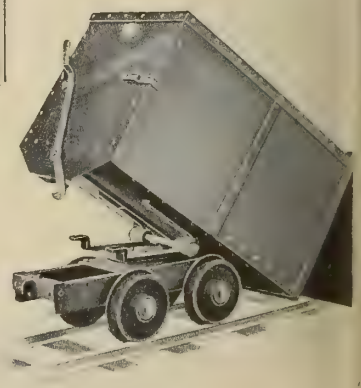
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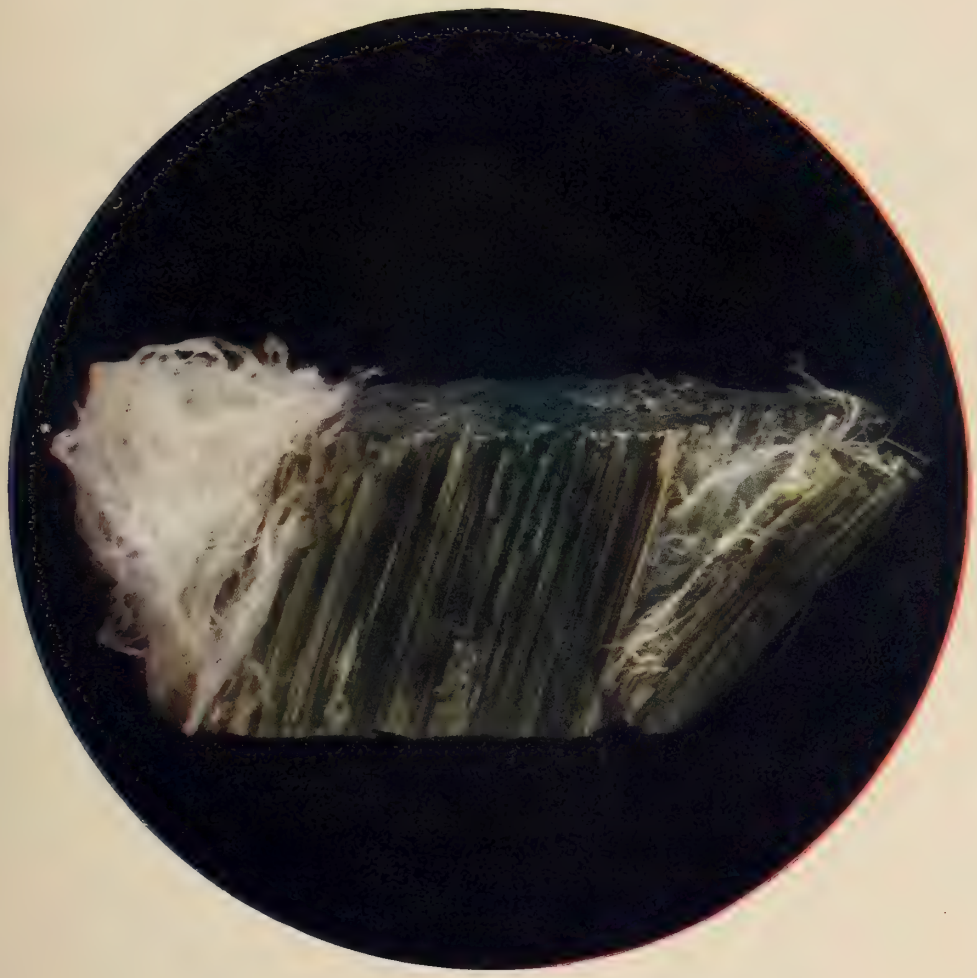
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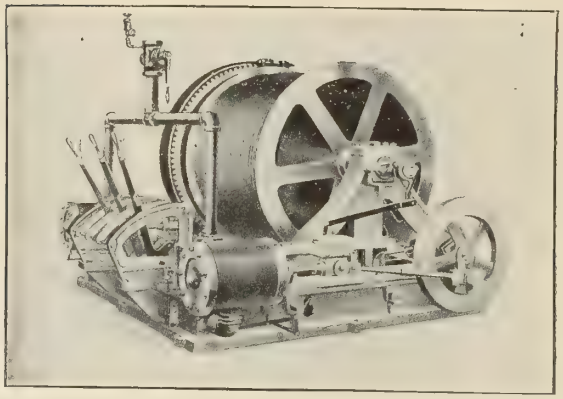
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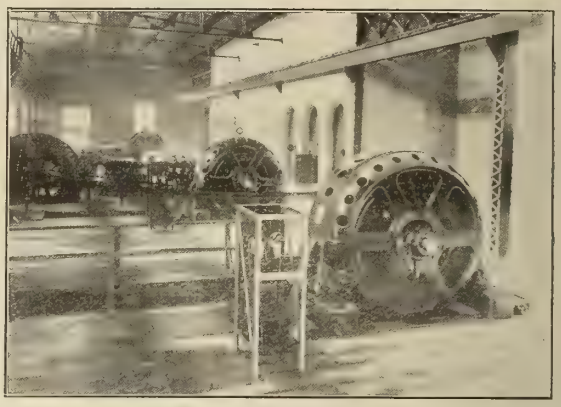
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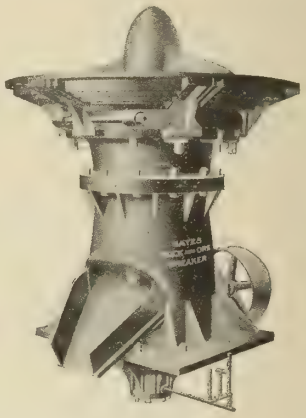
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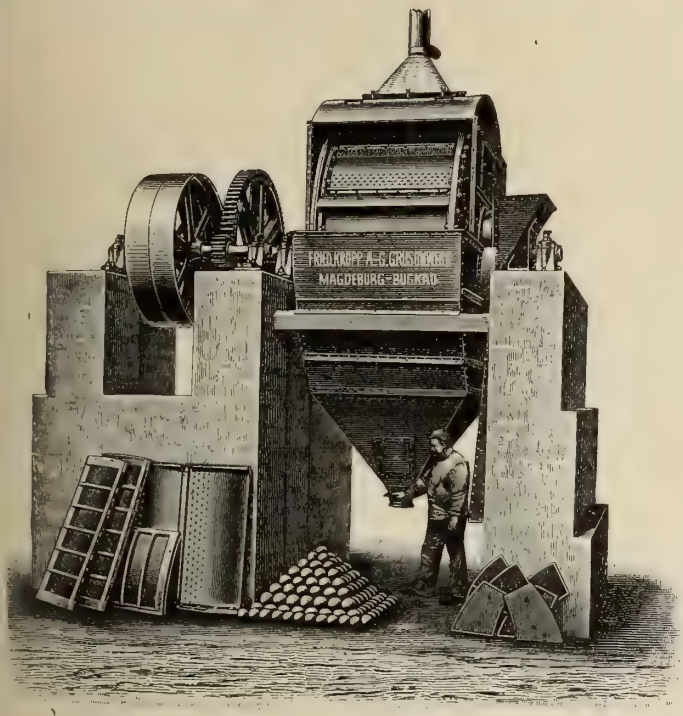
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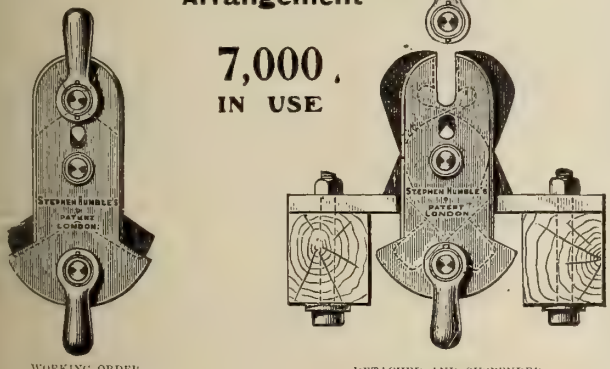
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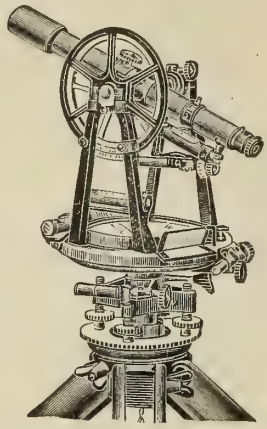
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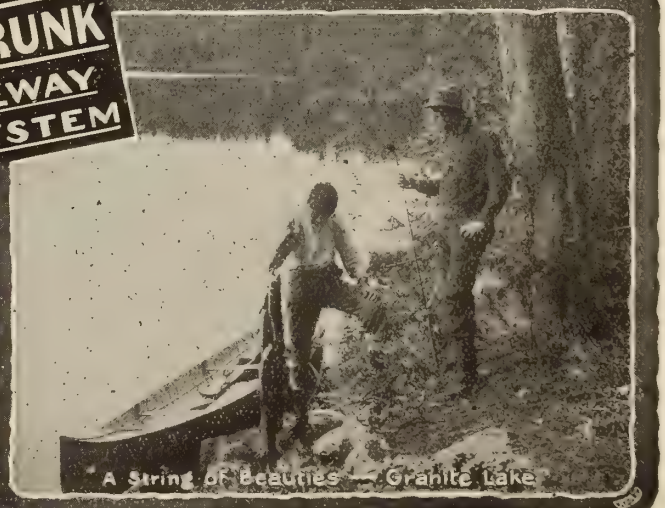
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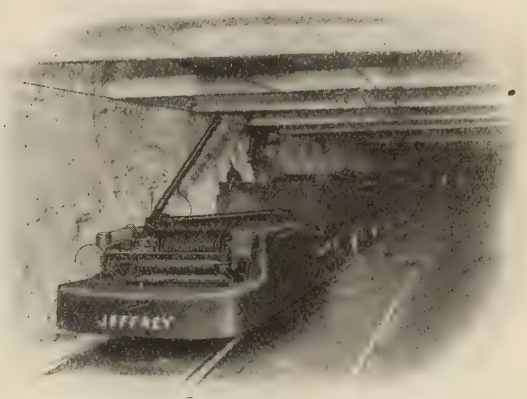
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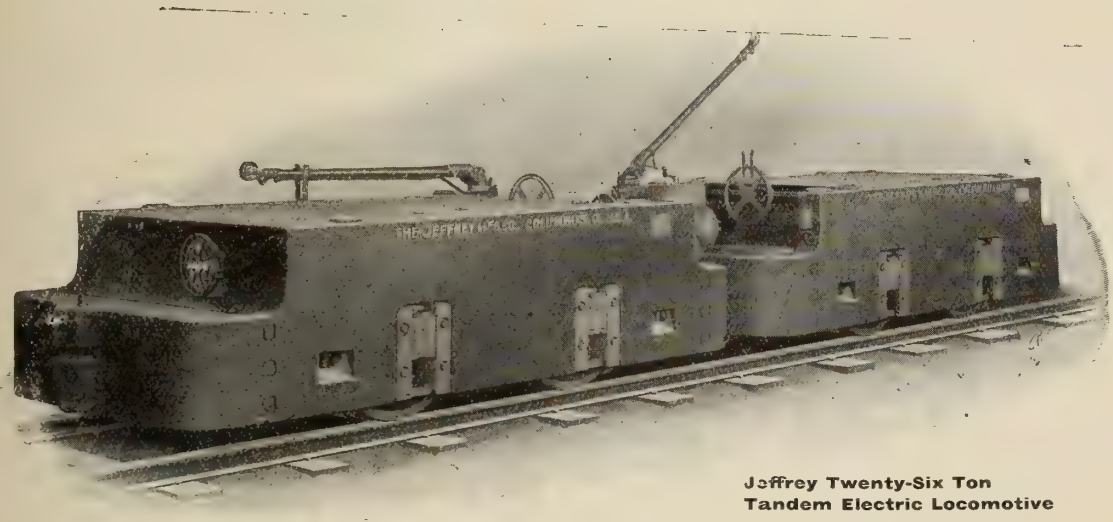


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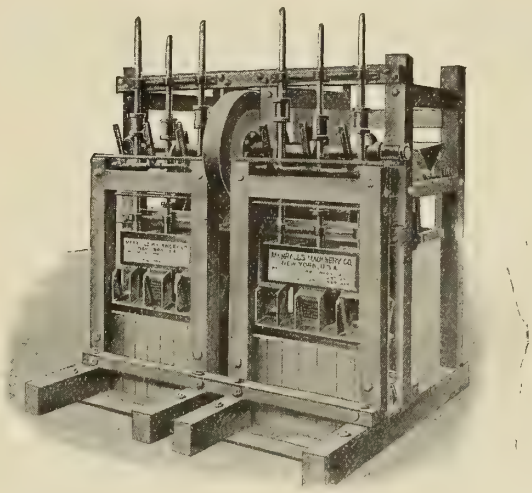
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The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

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The words "superior metals" include the ores of gold, silver, lead, copper, nickel, and also graphite, asbestos and phosphate of lime; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

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Persons working mines must send in yearly reports of their operations to the Government.

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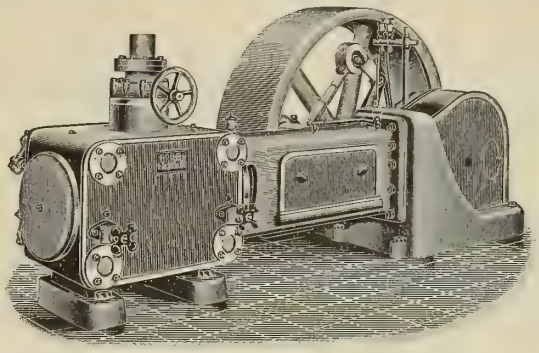
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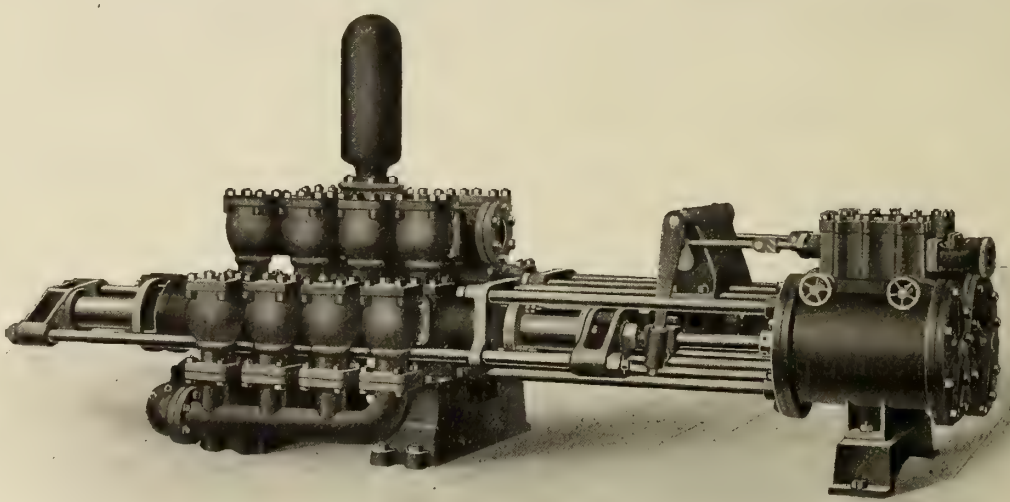
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J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMB
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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario. Dr. J. A. Woodman Dalhouse University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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COPPER

In his presidential address before the Institution of Mining and Metallurgy at the recent annual meeting, Prof. W. Gowland paid particular attention to the advances in copper smelting in late years. After pointing out that Great Britain, which, during the first half of last century, was the chief producer of copper in the world, gradually lost that position, owing first to the discovery of important deposits in Chili, later in the United States, and to the decreases in the output of the Cornish mines, the speaker proceeded to say that the present enormous output of the metal would have been quite impossible with the old methods, furnaces and appliances, some of which still survive in Continental Europe and in Great Britain. The extraordinary development of the copper industry is due chiefly to the remarkable increase in the size and capacity of furnaces; the application of the Bessemer process to copper mattes; the introduction of pyritic smelting; the general reduction in the costs of production; and last, but not least, the removal of the chief producing centres from the old world to the new. In Prof. Gowland's opinion advances as great, or perhaps greater, then those of the last fifty years will be made before the end of the next half century, probably, in part, in the following directions:—

(*a*) The extended application of producer gas as fuel in copper reverberatory furnaces. This would, he felt sure, be found to be specially efficatious with large furnaces, such as those of the Anaconda Company. Gas could be admitted at several points in their sides, and so secure a uniformly high temperature throughout their length.

(*b*) The introduction of the tilting furnace of the open-hearth steel manufacturer into the copper refinery. A movement in this direction has already been made at the Tacoma Refinery, Puget Sound, but oil and not gas is used as fuel.

(*c*) The extended adaptation of the Bessemer converter to the treatment of poor copper matte, etc. Even now, with a basic lining and the addition of silicious ores of value to the charge, a certain amount of success has been attained in this direction, but this is only an earnest of what may ultimately be reached.

(*d*) The roasting of cupriferous pyritic ores in cast iron vessels with a blast and additions of silica or lime.

(*e*) The utilization of the sulphur dioxide from the poor gases from calcining and roasting plants for the manufacture of sulphuric acid by a "contact" process.

(*f*) Lastly, but by no means least, the electric smelting of copper where water power for generating electricity can be obtained at small cost. This process at present, however, has not passed out of the experimental stage.

THE WESTERN COAL STRIKE

A satisfactory settlement has been reached at last. On May 6th Deputy Minister of Labor Mr. W. L. Mackenzie King announced in an official telegram to his Department in Ottawa, that, as a result of concilation proceedings, an agreement had been signed and the miners would resume work on the morrow.

By the terms of the agreement the men receive a five per cent. increase in wages and an eight-hour day from bank to bank. Other substantial concessions are made. It is agreed that if, in case of dispute, the difficulty is not settled by the first camp board, there shall be an immediate appeal to a board of arbitrators, whose chairman shall be named by the Minister of Labor. The agreement stands for two years, and provision is made for a meeting of operators and representatives of the union, sixty days before its expiry, for the purpose of arranging a renewal of the agreement.

If during this protracted struggle the men had remained at work, pending the action of the Board of Conciliation, they would have deserved in full measure public sympathy and support. In stopping work they took a step that entailed heavy loss to the industries depending upon a regular supply of fuel. For this they have no excuse. It is fatuous to affirm that this was done without the sanction of the Executive of the United Mine Workers. The stoppage of work was the result of concerted action by the members of the union, and this the public must remember, should disputes arise at any future time.

Mr. Mackenzie King appears to have performed his delicate task with skill and tact. The peculiar difficulties of the situation tested the new Labor Act very thoroughly. That a settlement has been reached peacefully reflects credit upon the Department of Labor, as represented by Mr. King, upon the operators and, in a much less degree, upon the miners themselves.

TO THE PUBLIC

A persistent attempt is being made to boom the Larder Lake district. In view of the prestige attaching to mining in Ontario because of Cobalt's great showing, it is not unlikely that many small investors will be induced to risk their money in one or other of the extravagantly advertised concerns which have been recently floated. At present, although something like four thousand locations have been staked out in the district, no development work of importance has been done and consequently the only foundations for the assumption that the area is a rich one are the newspaper reports of valuable finds and the publication of assay returns in prospectuses, which may mean anything or nothing. As a sample of the absurdities now being published by the daily press, we cut the following from a Montreal evening paper:—

"One prominent mining man of large experience in the different gold camps of the world, after visiting the camp, stated this could hardly be termed a mining camp at all, that it more nearly resembled a large manufacturing industry, with sufficient raw material on hand to run for centuries. The question, in his opinion, was simply one of the capacity of the machinery, and the amount of gold bars turned out would be limited only by the size of the plant for treating the ore."

How men of ordinary intelligence can possibly be influenced by such obvious nonsense as this baffles explanation. And yet the fact remains that it is just this sort of thing that the public will swallow without so much as winking.

AMERICAN INSTITUTE OF MINING ENGINEERS

The American Institute of Mining Engineers held its regular spring meeting in the auditorium of the new United Engineering Building on April 18th and 19th. Dr. Rossiter W. Raymond, the veteran secretary of the Institute, was called upon to speak by the President of the Council, Mr. John Hays Hammond. Dr. Raymond touched lightly on the history of the organization. He referred to the fact that for more than thirty years the Institute was not incorporated, nor had it settled headquarters. Any attempt to place it at one spot would simply have been a signal for the appearance of other local societies in other spots. There had been a time when Philadelphia, as the capital of a mining State, had strong claims to become the headquarters of the Institute. The establishment of a rival Institute in the West or of other national societies for iron, coal and steel had been projected at various times. But through all this troublous period the Institute, by being peripatetic, had kept itself national.

Dr. Raymond spoke in most glowingly laudatory terms of the work of Mr. Henry G. Morse, the junior member of the firm of architects who erected the building.

THE BUSINESS OF MINING

We wish to draw especial attention to an article which appears in this issue. It is entitled "Requirements of Modern Mining," and is reprinted from our contemporary, the *Mining and Scientific Press,* of San Francisco. We had intended commencing a series of articles defining and describing the *business* and profession of mining. This article covers so succinctly and so forcibly the whole subject that it deserves the most careful perusal. Taking it as a text, we shall attempt, in succeeding issues, to demonstrate how little the great majority of alleged "mining" schemes have to do with the legitimate business of mining. We most emphatically disclaim any intention of injuring individual mining camps. But, unfortunately, one or two of our otherwise promising districts have been made the hatching places of utterly extravagant schemes. If, in attacking these promotions, we cause incidental hardships to the mining districts involved, we shall be sorry—but it cannot be helped.

EDITORIAL NOTES

The recent readjustment of postal rates between Canada and the United States has forced THE CANADIAN MINING JOURNAL to raise its subscription rate from two dollars to three dollars. This applies only to new subscribers in the United States. American subscibers who have already sent in their subscriptions for the amount of two dollars will not be called upon to increase that amount until next year. But THE CANADIAN MINING JOURNAL could not continue to supply subscribers on the other side of the line at the two dollar rate without incurring considerable loss.

Although the production of nickel ore in New Caledonia showed a slight increase last year, as compared with 1905, the outlook for the industry in that colony does not appear to be very bright. As a result of the new mining law, which came into force in July last, thousands of acres of mining lands have been abandoned. This law compels the owners of mining lands to either continuously work the properties or else pay a double rental. A consular reports notes that this is tantamount to forcing production on a limited market, and as the whole of the nickel produced in New Caledonia is virtually the product of about eight of nine mines, the consequence of trying to force production on the world's markets is disastrous in the extreme, since, under fair conditions, it would be easily possible to double the present output. The total area of the mines abandoned during December, 1906, was 42,500 acres, and this will be exceeded during 1907 if the present restrictions are maintained.

The Rev. Dr. Robert Falconer has been appointed to the presidency of Toronto University. The choice is a fortunate one. Dr. Falconer is young and vigorous. He is an accomplished scholar and a successful educationist. The Provincial Government has displayed foresight and discretion in endowing the new president with large powers. Incidentally it is pleasant to note that the salary now attached to the office bears some proportion to the dignity and responsibility of such a high position.

Queen's University, recognizing the value of Provincial Geologist Wilbert G. Miller's services, has conferred upon him the honorary degree of Doctor of Laws. We sincerely congratulate Dr. Miller. We also congratulate Queen's upon being the first public educational institution to tangibly express its appreciation of Dr. Miller's unique and far-reaching work in developing the mineral wealth of Ontario.

British Columbia papers, in noting the fact that several of Cobalt's mine managers have been engaged from British Columbia camps, felicitate their Province upon possessing a superior class of mining engineers and miners. This is doubtless the case. But we would remind Cobalt that, should her demand for men remain unsatisfied, Nova Scotia also produces miners trained by long experience in metalliferous mines. With both British Columbia and Nova Scotia to draw on, and our mining schools turning out dozens of young graduates, we should depend in a constantly lessening degree upon talent imported from the United States.

ASBESTOS

(Written for THE CANADIAN MINING JOURNAL.)

It is not intended in this article to go into the geology of the rocks or the history of the serpentines in the Quebec asbestos belt of the Province of Quebec, as the subject has been taken up from time to time in the last 30 years by many well-known geologists of this and other countries, and many interesting articles have been written by such eminent geologists as Dr. Dawson, Prof. Logan, the late Dr. Sterry Hunt, and others.



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DRAWING ROOM—SHOWING PROCESS OF DRAWING AND DOUBLING AND COMBING.

It is of the commercial aspects and general information of the asbestos industry that we intend to treat in this

article, in such a manner that the lay mind may appreciate the importance of one of Canada's most useful mineral industries, one of which perhaps, less is known than of any other. This is probably due to the fact that very little speculation has ever taken place in the properties themselves, and very few, if any, stocks have been offered upon the market, of really first-class working propositions. The owners of asbestos properties as a rule have felt that the asset was sufficiently good to keep for themselves, with the result that the mines are generally owned by individuals or small companies.

Asbestos has been mined in Canada for the last 35 years, but for probably 45 years the mineral was known to exist in the Thetford district, in the Province of Quebec. Asbestos has been known almost as far back as we can trace history, for we know of the wrappings of ancient Egyptian mummies that date back at least 2,000 were apparently made of fine hand-woven asbestos cloth, which no doubt came from the old Italian workings—the same that are occasionally worked from time to time in our present day, although little or nothing is being done in the mines in Italy at present.

Asbestos has also been known for many years in Russian Siberia, and to-day is being successfully worked in years B.C., and we know that parts of the wrappings that country. Most of the Russian products are shipped to the markets of Europe. When the Russian deposits were first discovered the working was comparatively easy, as the asbestos was found in ridges of decomposed serpentine, which readily yielded to the pick and shovel; but, as these ridges were worked down the formation of harder serpentine presented itself, so that they are to-day using practically the same methods as are in use in Canadian mines. The material of the Siberian mines, however, is of a coarser grain and does not lend itself readily to the making of textiles or the finer grades of asbestos goods, and the distance of the mines from railway or water routes, even with the advantages of low wages, is not likely to permit it to become an active competitor of the Canadian article in America or Eastern Europe.

Uses.

The variety of uses to which asbestos has been put are unlimited, and new uses are daily found for it. All kinds of textiles in the shape of cloths for many different uses, such as stage curtains, firemen's clothing, fireproof gloves, fireproof hose, and so forth, are manufactured from it. The same textiles, when treated with a rubber solution, make an article that is absolutely waterproof. This is used for steam packings and numerous other purposes where the mixture of rubber and asbestos can be succesfully employed. For electrical uses, such as the insulation of wire, on account of its fireproof quanities, it is of extreme value. It is also used for cut-outs, fuses, switchboards, etc., etc. Immense quantities of it are manufactured into paper of different thicknesses up to three-quarter inch. It is used between floors and walls for deadening sound and prevention of vermin, and recently the Keasby & Mattison Company, of Ambler, Pa., the owners of the Bell Asbestos Mines, have manufactured roofing slates from asbestos, which have proven one of the most valuable and attractive articles that have probably yet been made. These slates are made in different colors, the three principal being slate color, grayish-white (or natural asbestos color), and terra cotta; which give a very pleasing effect for the roofing and sides of houses and buildings.



No. 2 DRIFT, 180 FEET TO RIGHT OF MAIN TUNNEL, BELL ASBESTOS MINE, THETFORD, P.Q.

They also manufacture corrugated and plain building lumber, in sheets from 2 feet to 4 feet wide by 4 feet to 8 feet in length.



HIGHEST GRADE CRUDE ASBESTOS ORE.

These latter can be given in any dimensions asked for, and the material is readily handled by any ordinary carpenters and cut and fitted with their tools.

Large quantities of asbestos are consumed in the manufacture of pipe and boiler covering, and it has many incidental uses in insulation, refrigerating and cold storage. The number of its uses is practically unlimited, in fact, and every day brings some new one.

MINES.

The mining of asbestos in Canada is confined to a very small area in the Province of Quebec, in the Counties of Megantic and Wolfe, in the Townships of Broughton, Thetford, Coleraine and Wolfestown. It is also mined at Danville, in the County of Richmond.

Of the mines, the Thetford group have even been the largest and most valuable producers, and the three large mines of that district, known as the Bell Mine, Kings' Mine, and Johnson's Mine, were among the first early workings in the history of the Quebec industry. The

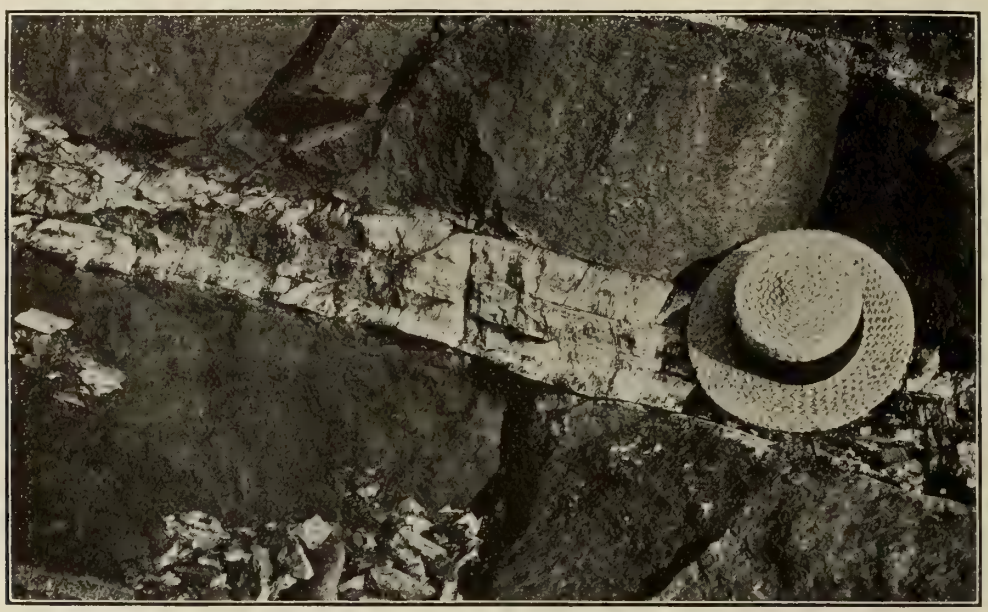


ASBESTOS FIBRE, NO. 1 QUALITY.

Bell Mine, which is the largest producing property and with the largest developed area, has been unique in one feature, *i.e.*, underground working, and it has clearly proven that underground working, or tunnelling and drifting, can be successfully carried on without timbering for the winter months, as they have already some 1,700 feet of underground workings, which are shown by the accompanying illustrations. The main tunnel on this mine varies in height from 17 to 28 feet, and with a general width of about 18 feet. The side drifts varying in heights from 16 to 24 feet and general widths of about 12 feet. This is the only asbestos property in which underground mining has been carried on to any extent, and the tunnelling and drifting of the past 18 months has developed workings fully equal to the main quarry, which has worked for the past 25 years, showing an amount of material which will last for many years to come. The main quarry of this mine is about 700 feet long by an average width of 250 to 300 feet; the Kings' Mine, which immediately adjoins the Bell Mine, has an opening almost equal to the Bell property, and the Johnson's Mine, south of the Bell property and immediately adjoining it, have two large pits which are nearly equivalent in size to the Bell pit. The depths on all three properties are about equal—200 feet from the highest point of the knoll on which the original discoveries were made.

The methods of mining are nearly identical in all the Canadian properties, and they are worked as ordinary open quarries with overhead cableway systems. In this short description of the properties at Thetford, we practically give a description of the works at Black Lake, Coleraine, Broughton and Danville

The methods of treating the ore in all cases are practically identical. After the rock is blasted, as much of the large seams as can be readily picked up in the pits are first gathered, sent to the cobbing houses for further treatment or clearing of any bits of rock that may be adhering to them. The larger pieces of rock are then block-holed and re-blasted, so that they may be all passed into an ordinary jaw crusher of large dimensions, from 12 x 20 inch to 24 x 36 inch openings. The treatment is a continuation of gradual reduction; the asbestos fibre being drawn off in the process and separated into different lengths, which give it its value. The value of the material is in the length of the fibre and its cleanliness.



ASBESTOS VEIN IN THE SERPENTINE ROCKS



MULE ROOM—SHOWING PROCESS OF SPINNING.



WEAVE SHED OF A MODERN MILL.

Much could be said in reference to the milling of asbestos and the treating of the fibre, but to go into it exhaustively would hardly be interesting to those not directly concerned in the business. The handling of the waste material or non-productive rock, is one of the large

problems in the mining of asbestos, which may be appreciated by the fact that to handle the waste material of the three large mines at Thetford 11 locomotives and over 300 five ton ore cars daily are required.

The number of men employed in the industry in Quebec is over 2,000, and the annual wage roll for 1907 will be very close to the $1,000,000 mark.

The increase in the industry is best demonstrated by the fact that in 1878 only about 400 tons of ore was shipped, and this containing considerable foreign matter, while in 1906 over 50,00 tons of asbestos of different grades were shipped and over 20,000 tons of asbestos, the latter being the refuse of the mills and principally used for wall plastering; and the output for 1907 will show a large increase over former years, but even so the demand is much larger than the apparent supply.

THE CANADIAN ASBESTOS INDUSTRY

By Fritz Cirkel, Mining Engineer, Montreal.

The asbestos industry of Canada has shown for several years past a steady, healthful progress, and it is fair to assume, judging from the present activity displayed, that this condition will not only last but that the future will see a still larger delelopment of the existing resources in the region generally designated as the Black Lake, Thetford and East Broughton areas. This is principally due to the increasing demand for the refined article in the United States and in European countries. Prices for the crude as well as for mill fibre have advanced all round, and some of the mines and mills are taxed to their utmost capacity to fill the present requirements. This caused several companies, especially those possessing the larger mines and mills, to enlarge their plants, and has also stimulated the demand for undeveloped asbestos properties in an exceptional degree. However, the number of promising undeveloped properties, unlike any other established mining district, is very limited; and as Canada is looked upon as the country which supplies asbestos for nearly the whole world, it is fair to assume that the future outlook for the companies at present operating in the district is indeed very encouraging. The only trouble experienced for the last year or two is the scarcity of men, and several of the larger concerns have been working with a crew far insufficient for the capacity of their respective plants. Wages have consequently advanced, and where a laborer several years ago was paid about $1.15 and $1.25 for a ten-hour shift, to-day $1.50 and in some mines even $1.75 is paid.



BLACK LAKE, P.Q.

Through the acquisition of several mines in Black Lake by American capitalists, this locality is displaying an activity never attained before. The American Asbestos Company, which put up a very elaborate milling plant several years ago at a cost of about $350,000, is employing about 240 men; in addition, the properties belonging to the Manhatten and the Glasgow and Montreal Companies have been acquired by the same company, and a crew of about 40 men is employed in these mines.

The Standard Asbestos Company is working at its full capacity; 45 men are employed, and the large pit, which now has been worked for a number of years, produces ore of an excellent quality.

The mill, which is located close to the mine, treats about 100 tons per day, and the fibre extracted is considered one of the best in the camp.

A part of the property belonging to the Standard Asbestos Company has been sold to American people, and the new company, the Dominion Asbestos Company, is putting up a large 300 ton mill, under the superintendence of Mr. Simpson.

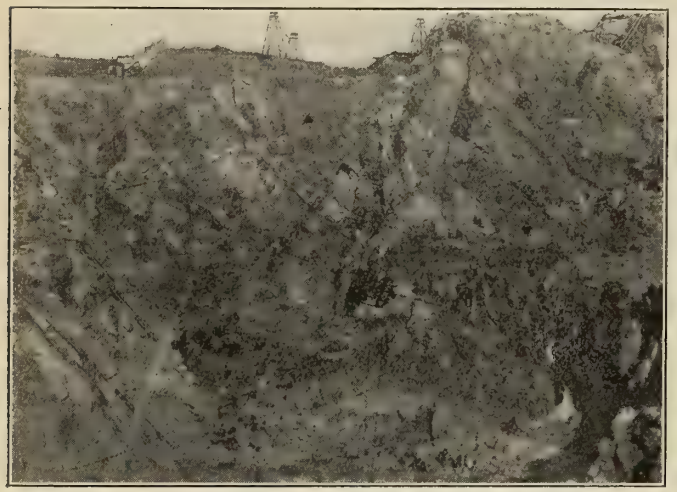


THE TOWN OF THETFORD, P.Q.

In Thetford an innovation has been made by Mr. George Smith, the manager of the Bell Asbestos Company, now controlled by capitalists of Ambler, Pa. An inclined tunnel has been driven, through which a direct rail connection is made between the large quarry and the mill. The entrance to this tunnel is located on the southern side of the Quebec Central Railroad track, and at a distance of about 800 feet from the big mill. It is intended to make this tunnel the principal part of a new elaborate haulage system to be installed at the mine; instead of the overhead cableways, the ore will be loaded in the pit directly into the large 3 ton dumping cars and drawn by machinery directly to the mill. It is claimed that a great saving is made in this way, obviating the necessity of hauling the ore twice. The tunnel penetrated some hitherto unexpected rich ground, and it is predicted that the same will form the main basis

for carrying on underground operations during the winter.

The Johnson Asbestos Company and the works of H. M. Whitney (formerly King Bros.' Mine), are working at their full capacity, while the Beaver Asbestos Company is working some very rich ground, recently discovered close to the old pit.



BIG QUARRY, BELL ASBESTOS MINE

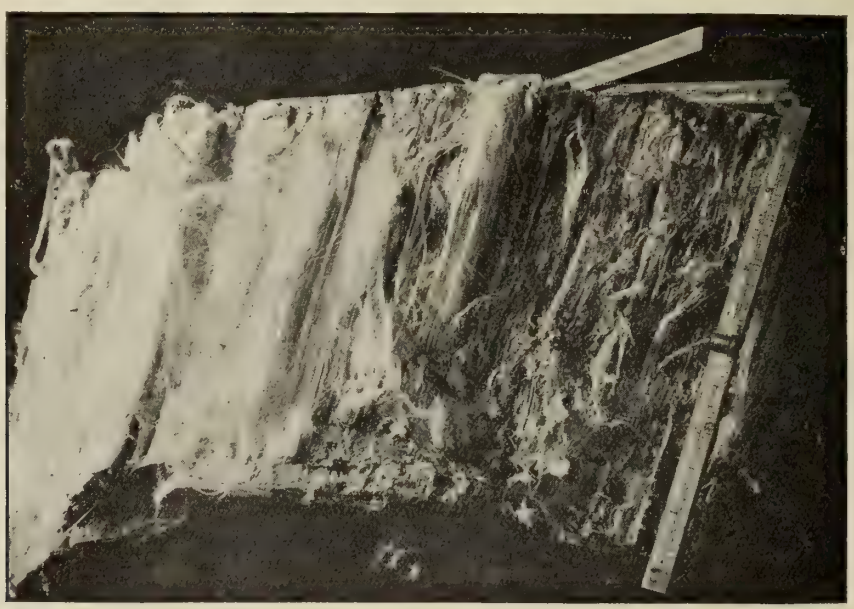
Dr. Reed, of Reedsvale, has been developing his mine on Lot 13, Range V., Township of Thetford. Asbestos occurs here on the slope of a hill; several test pits have been sunk in a light green serpentine, resembling that of East Broughton. A cut 160 feet long into the slope of the hill exhibits some very fine veins of asbestos, and several trenches indicate the extent of the serpentine formation.

Broughton serpentine is completely shattered, is softer and can be far easier mined. The asbestos here forms small gashy veins, along the cleavage planes, is sometimes crushed and drawn out and seems at places to be disseminated through the whole mass of serpentine. The fibre, though some of it is short, is an excellent quality, being when freshly broken of a grass green color. Occasionally fibre measuring 1 inch and 1 1-2 inch in width is found. This area is located at a distance of about 22 miles from Thetford station, to the west of the Quebec Central Railroad. There are only two companies working at the present time in this belt, the Quebec Asbestos Company and the Broughton Asbestos Company.

The main pit of the Quebec Asbestos Company measures 200 x 75 feet, with a depth of 45 feet. About 50 men are employed. At the present moment the company's entire plant is being overhauled; a new Campbell dryer is being installed and importantant improvements are made in the mill. The latter will have a capacity of about 150 tons in a double shift.

As the drying of the East Broughton ore is always a matter of vital importance on account of the large amount of moisture the rock contains, improvements have lately been made in the rotary dryer, usually employed for the purpose. The main tube of the Campbell dryer has a diameter of five feet and a length of 35 feet, and contains 5 smaller inside tubes parallel to the main axis. By a special arrangement at the feed end, each smaller tube receives its quota of ore for drying, and it is claimed that through the increase of drying space the efficiency is brought up to its maximum.

The Broughton Asbestos Company, which works a property close to the Quebec Asbestos Company, has suspended its mining and milling operations for the last three or four months. The original capacity of the mill was 125 tons per day, but by the additions now being made, about 350 tons can be treated. Four large rotary dryers, several new cableways, with all the necessary machinery are being installed, while a new tramway is being constructed to haul the ore from the pits located in the northeasterly part of the property to the mill. Mr. H. H. Williams is the general manager of this excellently handled mine.



CRUDE ASBESTOS

Special attention has been paid lately to the asbestos mines at East Broughton. This small detached area of serpentine is enclosed between a highly quarztose slate and greenish schists of Cambrian age. Its largest width is about 700 feet, and its general trend about 20 degrees east of north. In comparison with the serpentine of Black Lake and Thetford, which is very hard, the East

A mill with a capacity of about 200 tons is now being erected by Mr. Phillip Angers, of Beauceville, and associates, on the valuable ground located between the mines of the Broguhton and the Quebec Companies. Very fine outcrops on this property show the continuation of the asbestos-bearing ground opened up by the two companies above referred to, and there is every reason to suppose that this intervening stretch will carry just as rich ground as that worked by the neighboring mines.

There is a possibility that the mines formerly operated by the Glasgow and Montreal people will be worked again. This property adjoins the mine of the Broughton Asbestos Company to the southeast; mining was here carried on many years ago, and was confined to a peculiar vein, which was developed on the southeast margin of the serpentine close to the contact with the overlying schistose slates, which have at this place a dip to the southeast of 65 degrees.

The asbestos veins, which in places assume a thickness of 10 and 12 inches, follows a wall of soft talcose rock or soapstone from 12 to 14 inches thick. The quality of the veins is excellent; they split up sometimes into fine strings through the sepentine, and at other places uniting and forming a continuous lead. The shafts were sunk to a depth of 60, 62 and 75 feet respectively, following the slope of the soapstone.

On the east half of Lot 13, Range VI., Township of Broughton, the northeastern extension of the East Broughton serpentine belt, on which the Quebec & Broughton Companies are working, has been established by numerous outcrops and test holes, and it is likely that a company which is now being organized in Quebec will develop this property on an extensive scale.

The Danville area, located at a distance of 38 miles in a southeastern direction from Thetford, is showing its usual activity; the Danville Asbestos Company & Asbestic Company is the only company operating at present in this district. This company, with is magnificent machinery plant and miling appliances, is capable of mining and milling about 600 tons of asbestos rock per day, and is considered one of the largest asbestos operators in the Eastern Townships. The serpentine is of a very fibrous nature, like the East Broughton species, and for this reason delivers an excellent material for the manufacture of asbestic.

At a distance of four miles from the Danville mines, several locations have been made in the Township of Tingwick, Arthabasca County, apparently in the same serpentine belt. On one of them, Lot 21, Range 11, prospecting and development work have disclosed a number of promising asbestos chutes. On the bank of a small river quite a number of asbestos veins can be noticed; in an open cut about 50 feet long and 15 feet deep, almost at right angles to the river bank, veins of asbestos 1-2 inch and 3-4 inch wide are exhibited in a number of places, while in a pit not far distant, about 15 feet deep, the continuation of the asbestos-bearing formation is established.

The property adjacent to that above described has been opened up to a considerable extent by New York people; a small separation plant has ben erected on the premises, and the tests with the ore from this property



VEINS OF ASBESTOS—ASBESTOS AND ASBESTIC CO'S MINE DANVILLE P.Q.

are reported to have been so satisfactory that the option on the property has been taken up recently by the parties interested.

In conclusion it may be said that the asbestos industry of Canada is of special interest to the mining and industrial world from the fact that, in so far as is known, the asbestos areas of the Eastern Townships contain practically the only deposits, where the mineral of a quality adapted for spinning and for the finer purposes of manufacture can be mined and milled at a profit. So great are the advantages which these mines possess, particularly as regards accessibility and the ease with which the extraction of the fibre is now accomplished in the mills, that, unless fields as yet unknown and as easy of access can be discovered, the Province of Quebec will long enjoy the privilege of being the principal source of supply for this particular mineral, not only on the North American continent, but in the whole world.

As a result of the great activity in the mining of this mineral there are to-day sixteen mills in operation, three others are in course of construction, while one will be erected in the course of the coming summer. The total capacity of all these mills when completed will be in the neighborhood of 4,500 tons of asbestos rock per day, with an approximate output of 250 tons of mill fibre. Since the introduction of machinery into the separation methods, the production of the crude has lessened a great deal; the mines of Thetford, with their exceptionally rich ground, produce at present the bulk of the crude, while Black Lake contributes also to some extent towards the supply of this quality.

ECONOMIC MINERALS OF NOVA SCOTIA

Catalogue and description of a collection at the Dominion Exhibition, Halifax. Prepared under direction of the Department of Public Works and Mines by Harry Piers, Curator of the Provincial Museum, Halifax, N.S., -906.

In this pamphlet, Mr. Piers has collected and collated information about all the economic minerals of Nova Scotia. Facts and figures have been used with discretion, and we would strongly recommend perusal of this pamphlet to anyone who wishes to learn something of the remarkable extent and variety of the mineral deposits of Nova Scotia.

Meanwhile it is not unprofitable to glance hurriedly over the main features of the catalogue.

Coal.—For the calendar year 1905 Nova Scotia produced 5,279,621 long tons of coal, being over 60 per cent. of the entire coal output of Canada for the year.

Coke is manufactured at Sydney, North Sydney, Stellarton, Westville and Londonderry for use in the blast furnaces at Sydney, North Sydney and Londonderry. The Dominion Tar & Chemical Company, Sydney, obtains coal tar from the Dominion Iron & Steel Company, and manufactures refined tar, roofing cement, black varnish, crude naptha, light oil, carbolic acid, creosote oil, shingle stains of various tints, soluble disinfectant, roofing pitch, etc.

Gold.—The gold fields of Nova Scotia cover about 3,000 square miles, exclusive of the masses of intrusive granite. The gold-bearing strata, of Lower Cambrian age, have been folded into numerous anticlines and synclines, having a general east and west course and north and south dips. The gold-bearing quartz assumes the form of intercalated veins between the strata of the rocks. Denudation of the crowns of the anticlines often exposes long elliptical outcrops of the veins. Where the lower veins, untouched by denudation, pass over the axes of the anticlines, they thicken, forming "saddle backs."

Fissure veins, cutting the strata, also have been worked.

Alluvial gold is found in many places in Nova Scotia.

Nova Scotian gold has a fineness of over 900, and occurs largely as free gold in quartz, accompanied by sulphides of iron, copper, zinc and lead. Arsenopyrite is also a usual concomitant of gold.

From 1862 to 1905, inclusive, Nova Scotia has produced $15,859,345 in gold. This was obtained from 1,688,649 tons of quartz, being an average yield of 9 dwt. 22 grs. per ton., valuing the gold at $19 per ounce.

Antimony.—Stibnite, or sulphide of antimony, is mined at West Gore, in Hants County. It was discovered in 1880 on J. McDougall's farm. The ore occurs in two main fissure veins, called respectively the North and South veins. The North vein runs north 45 degrees west and dips 85 degrees to southwest, and has been traced for over 1,200 feet. It varies from a few inches to 7 feet, and has been solid stibnite in its widest part. The ore chute dips 45 degrees to the southeast. More or less gold is found in the ore, and it seems to be richest in that metal when the percentage of stibnite is high. The gold values vary from $200 per ton to $23. For a long time it was not known that the ore contained gold.

Graphite.—In some cases this mineral occurs in apparently workable quantities, but no attempt so far has been made to exploit the deposits. H. T. McDougall's property, near Christmas Island, Cape Breton County, showed:—

Graphitic carbon	50.23 per cent.
Rock matter	43.37 per cent.
Water	6.50 per cent.

Copper.—Native copper occurs at Cape d'Or in veins and joints in the triassic trap. Chalcocite, malachite, chalcopyrite and bornite are found in various localities in Pictou, Antigonish, Colchester and Inverness counties. The chalcopyrite usually carries gold and silver values.

Lead.—At Smithfield, near Upper Stewiacke, Colchester county, galena is found in carboniferous limestone, apparently replacing it in part and as a residual concentration from the removal of the rock. It is argentiferous. Certain limestones in Pictou, Colchester, Halifax, Guysboro', and in Cape Breton at Cheticamp, carry galena which is more or less silver-bearing.

Iron Ores.—Ores of iron are known in workable amounts in nearly every county of Nova Scotia. Magnetite, red hematite, limonite, ankerite, siderite, paint ores, etc., occur. At present mining operations are confined chiefly to the property of the Londonderry Iron & Mining Company, Colchester county, and to the Torbrook district, Annapolis county. Deposits are known at Clementsport, Clifton, Brookfield, Arisaig, East Bay, Boisdale, etc., etc.

Pyrite.—Large deposits of pyrite and pyrrhotite have been found in Cape Breton at George's River Mountain.

Tungsten.—Hübnerite, a tungstate of manganese, has been found near Emerald, Inverness county. Scheelite, or calcium tungstate, occurs in the Malaga gold district.

Hübnerite was discovered in 1898. It is distributed irregularly through a mass of grayish-white quartz weighing about a ton and a half, at the outcrop of a lenticular vein of similar quartz some 2 1-2 to 3 feet in width, cutting a red gneissic or granitic rock of pre-Cambrian age.

Manganese.—The ores of manganese found in Nova Scotia are noted for their purity. They occur in the limestone series of the carboniferous at a number of places in the Province. The best known locality extends from Tenny Cape to Walton, in Hants county. Here the ore has been worked at intervals for a number of years. At one time the price realized was as high as $130 per ton. The ore occurs in stringers and pockets in limestone at its contact with the underlying sandstone. Surface indications along the contact are extending over a large area, but little work is being done. Similar ores are met in Colchester county and in Cape Breton. Their value will be enhanced when railway communication has been improved.

One pocket of pyrolusite at Tenny Cape yielded over 1,000 tons of ore of exceptional purity. Pyrolusite is the prevailing form in which manganese is found, but psilomelane and manganite are also found.

Gypsum.—Deposits of this mineral are very abundant in the carboniferous limestones of the central, northern and eastern counties, and some of the beds are of great thickness. The principal quarries are operated near Windsor, Hants county. About 150,000 tons are exported to the United States annually.

Limestone, dolomite, and barite are of very frequent occurrence in various parts of the Province.

Diatomaceous Earth.—Deposits of diatomaceous or infusorial earth are common in lakes and swamps, and have been worked at Bass River, Colchester county, and at St. Ann's, Victoria county. It is used for polishing purposes, as a non-conducting material, for making soda silicate, and also as an absorbent in the manufacture of dynamite. The Bass River deposit is operated by the Fossil Flour Company.

Talc and Pyrophyllite occur in Cape Breton in commercial quantities.

Building Stones, such as sandstone, granite, limestone, metamorphosed slate, etc., are worked in many places. Several grindstone quarries are in operation.

Clay, Brick and Pottery industries are carried on in several counties.

Fire Clay, Moulding Sand, Roofing Slate and Pigments may also be mentioned.

Brine.—The Nova Scotia Oil & Gas Company borehole, Cheverie, Hants county, was put down to find petroleum. A large flow of brine was encountered.

The above gives but a scanty suggestion of the variety of Nova Scotia's mineral resources. Were a fraction of the money that is being flung freely to the vendors of worthless mining stocks to be diverted to the development of some of the deposits enumerated above, Canada would be richer by several new and successful industries.

REQUIREMENTS OF MODERN MINING

By J. R. Finlay.

(Reprinted from the *Mining and Scientific Press.*)

But neglecting questions that must become vital with our immediate descendants, it is interesting to consider the vast extent and variety of the mining industry as it stands to-day. The field is so great that it permits only of specialists. Does any one man know, in a practical way, the mode of occurrence of most of the valuable minerals? Does he know coal, iron, copper, gold, silver, lead, zinc, cement, precious stones, as they occur in the earth? If he does, can he possibly know the processes required to get them to the surface, and put them in marketable form? If he knows this, can he possibly know how to market them? If he knows all these things, will he then know how to finance and launch enterprises to exploit them?

We call a man a mining engineer if he can make an underground survey; a mining man if he owns some stock in a prospect. From these crude beginnings the experience of many individuals makes great advances, but it seems incredible that any intellect, or any energy, would be sufficient to get more than a thin comprehension of the vast subject.

I used to think I would be quite a mining man when I reached the position of superintendent of a property. Later I found that achievement to mean little. Success in handling one mine may be due to some quality that may be next to useless in the next one. At the first mine a man may need only operating talent—capacity to organize and get work out of men. At another, such ability may be absolutely unavailable, unless it be joined with intelligence and training in finding ore. As a man's experience in mining widens, he is constantly reproaching himself for want of knowledge on essential portions of the business, until he finally consoles himself with the reflection that if he had learned the things he doesn't know, he might on that account remain ignorant of the things he does know. At best, one's brain and one's opportunity have their limitations, and it does not take an intelligent man many years to convince himself that pretension to know the whole mining business can be nothing but a fraud, and the expectation to do so only a delusion. Nevertheless, if one may cover the requirements in the case of one or two metals, his equipment will be abundant to secure him his "shoes and tobacco"; and it may be of interest to discuss what these requirements are. I venture the following generalization:

The business of mining involves

1. Ore and mineral deposits.
2. Operation of mines.
3. Processes to render mineral products marketable.
4. Marketing.
5. Financing and organization of enterprises.

The first division is entirely in the realm of natural phenomena and facts. The second and third deal partly with nature in the handling of them. The fourth and fifth divisions are wholly matters of human dealings. It is rather painful to the striving engineer, after laboring over the science and technology of his profession, to find that after all he has been working on a small part of his business, and that the least important. In its broad aspects mining is far more of a question of human relations and facts, than of natural relations and facts.

Now it may be objected that this generalization is either self-evident or meaningless. I shall give an illustration to show how all these considerations must be weighed in the commonest problems of mine operation. At Joplin, Missouri, the ore consists of pieces of singularly pure galena and blende, distributed unevenly through the rock. If these ores could be sorted by hand, it would be easy to pick out stuff running from 30 to 60, or 70 per cent. in zinc or lead. Naturally it would be

desirable to do this, instead of crushing the beautiful crystals in a mill and thereby losing 20 to 50 per cent. of them. Why not do it? Simply because the market conditions at Joplin do not allow it. Local practice, too strongly intrenched for the small operator to interfere with, and doubtless founded upon good reason, dictates that a zinc ore must be cleaned until it carries about 60 per cent. zinc. Failure to bring the ore up to this grade is penalized so severely as to wipe out any possible profits in saving mill costs and losses by hand sorting. It is obviously impossible to depend on hand sorting to produce from a low grade mixture an ore that will conform to a rigid standard of value.

Here we see the human condition of marketing reacting imperiously on the method of mining. It makes a mill necessary, where under a different market it might often not be necessary. It throws the industry into a certain channel, out of which the operator cannot go without meeting certain failure. This consideration influences the view one must take of the value of a deposit, the method of mining, the requirements of milling, and, consequent on all these, the financing of a project.

In the Rocky Mountain region the smelter imposes no conditions except a freight and treatment charge, varying within modest limits according to the grade and composition of the ore. Here the question of what it is wise to spend on mining and sorting on the one hand, and how much to lose in a mill and how much to pay for freight and treatment, on the other, is a very broad one. It may be capable of many solutions, each of which may mean a different result in dollars and cents.

A gentleman in charge of a large and valuable group of silver-lead mines announced the other day, with breathless triumph, "I have raised my mining costs 10 per cent., raised the grade of my ore 25 per cent., and increased my profits 100 per cent., and, do you know, my directors are kicking about my high costs!" I submit that in this case millions of dollars in mine valuation depend upon a trick of mine operating. What a different view one would take of the property before and after the determination of the above results!

In like manner we hear of important interests in coal mining being rendered dangerous as investments, because the railroads will not furnish cars. Here the question is apt to be, not what kind of a mine have you, but, what are your relations with the railroad?

It is probably true that in the majority of cases the determination of trade and finance questions is left to specialists in those lines. Indeed, in any event, there must be questions of this kind that are as inherently the work of specialists as the work of an assayer or a machine-runner. My point is, that the mine manager or the mine valuer must be broad enough to recognize the fact that the man who sells ore, or buys ore, or promotes a scheme of mining enterprise, has just as much claim for recognition as a factor in the business as the mine superintendent or the metallurgical engineer. Perhaps far more. Reflect, that the men who now control the greatest enterprises are not mining engineers; they did not even begin as mine owners; they were business men whose business was refining oil and selling it, or financing smelting enterprises; they were men whose wits were sharpened by competition. There is not competition in the ownership of a bonanza mine. The owners are generally spoiled by having too much of a snap; they have not, as a rule, expanded to the true requirements of their business, and while hugging themselves for their success, they are really stagnating in a small corner of the field.

Much has been written about mine valuation, and mostly with a failure to recognize the full scope of the subject. Everyone knows that to take samples and measure the ore in reserve by some fixed rule, requires no more than honesty, care and some knowledge of solid geometry. That does not go far. The mine remains, and new ore is found after the ore once in reserve is gone. The geologist may go further and arrive at a correct conception of the persistence and extent of the mineralization, but does he know what the ore can be mined for? In many cases he does not know. The foundation is laid, let us say, that a million tons of ore may be relied on, carrying a certain amount of various metals. Still the valuation is only begun. The great problems remain of how it can be mined, how milled, how smelted, and how marketed at the maximum profit; and how may an enterprise be organized and financed so as to realize the maximum profit for the investor. I contend that the answering of these questions is by far the greater part of mine valuation. A mine may be a grand success, financed at $10,000,000, and a dreadful failure if financed at $5,000,000. Who will decide this? A man who can operate a mine? One who understands ore deposits? One who can operate a smelter? A man who can sell steel rails or cuff buttons? A man who can furnish the money? None of these. All of them together can perhaps; but very much better a man who can weigh with discrimination the evidence of each.

I venture to say that the men in this country who are able to bring to bear on a gold mine, or a copper mine, or a lead mine, such an equipment, and who have an opportunity to do it, may certainly be counted on the fingers of one hand. If these problems are so complex and far-reaching to-day, they are sure to be more complex and more far-reaching. What financing and what methods will be required twenty-five years hence, when the world will require several times the amount of mineral products it requires to-day! It is difficult to imagine, from present knowledge, how such vast demands are to be met. "Ore in sight" will not meet them. Scientific exploration and development, improved methods, the use of new materials to substitute those now in use, will all help. To do these things is a splendid field for good brains. It is a comfort to know that the business of mining is no fake, but a most essential—and perhaps the most distinctive—part of modern civilization. Many a young man now behind a tramcar, or a drilling machine, thinks mining a pretty tough business. So it is. So is war also a tough business. If war produced the greatest reputations, mining has produced the greatest fortunes of the world; and in both there is room for future Napoleons.

PEAT

The principal difficulty in the utilization of peat as a fuel for the various processes of manufacture, or for domestic purposes, is apparently the large quantity of contained moisture and the great difficulty experienced in its removal. This difficulty arises in large part from the porosity or springiness of the material, and many trials and experiments have been made by which this tendency to absorb moisture could be checked when once it had been eliminated. As a result of these, the plan of pulverizing the peat as it comes from the bog, drying it as rapidly as possible, and then solidifying it under great pressure, has been found to yield the most satisfactory results.

THE ANALYSIS OF SILICATE AND CARBONATE ROCKS.

By W. F. Hillebrand, Bulletin No. 305, United States Geological Survey.

This bulletin so thoroughly covers the ground outlined by the title that it could very appropriately be termed a manual.

Dr. Hillebrand, in his introductory remarks, dwells upon the small amount of energy devoted to mineral analysis as compared with the enormous volume of work spent upon the organic field.

To more strongly emphasize the importance of completeness in analysis, Dr. Hillebrand cites a few facts, deduced from hundreds of rock analyses. The existence of small percentages, usually not over 0.1 per cent., but sometimes much more, of barium and strontium in the igneous rock of the United States and in their derivations, has been conclusively proved. The amount of barium is almost always in excess of that of strontium; and the igneous rocks of the Rocky Mountains show far higher average percentages of both metals than the rocks of the eastern and more western countries. "Surely," says Dr. Hillebrand, "this concentration of certain chemical elements in certain geographic zones has a significance which future geologists will be able to interpret if those of to-day are not." Continued investigation has thrown much light on the distribution of vanadium and molybdenum.

A particularly pointed exemplification of the benefits of complete analysis is given on page 19. By invariably looking for sulphur in rocks, even when no sulphides were visible to the eye, Dr. Hillebrand found that it is almost always present. This demonstration clears up the mystifying disparity between results of ferrous iron determination obtained by the Metscherlich and the hydrofluoric acid methods. Sulphur can almost always be detected in 2 grams of rock powder. Almost all rocks and many minerals carry pyrite or pyrrhotite in considerable amount or in traces.

The thoroughness of the United States Government Laboratory work is shown by the care with which every step in the preparation of samples is investigated. For rock analysis, 20 grams is recommended as a suitable quantity for fine grinding, and agate mortars are preferable to glass or steel. The limits of error in summation of analytical results are set by the total figures, 99.75 and 100.75.

SOME PRINCIPLES OF COAL WASHING

WRITTEN FOR THE CANADIAN MINING JOURNAL.

The great majority of North American coals are fit, as mined, for steam-raising and general purposes. Many of them, however, contain sufficient impurity to render incompatible with the highest economy, or even commercially impossible, their immediate employment in metallurgy. Others, notably certain European coals, contain, for practically all purposes, prohibitive amounts of impurity. Relatively few, and quite inadequate to the enormous demand, are those which, as received at the mine bankhead, can be converted forthwith into coke meet for the ironmaster's use; and hence arises the necessity for the coal-washer, which we shall here consider exclusively as the sentinel of the blast furnace.

What are the impurities, whose presence in excess unfits a coal, otherwise suitable, for the manufacture of blast furnace coke? What constitutes an excess? Can this excess be economcially removed? There are the questions which, answered in the light of local and prevailing conditions, determine the attitude of the blast furnace superintendent toward any coking coal.

I.—Impurities in coal may be classified as:—

(a) Innate.
(b) Sedimentary.
(c) Infiltrated.

Innate impurities are chiefly such percentages of silica and alumina as, originally present in the ash of the parent plant, have persisted in the coal. They seldom constitute less than 2.00 per cent. or more than 4.00 per cent. of any coal. In very rare instances they represent the total impurity.

Sedimentary impurities are chiefly slates, shales, and clay stone, formed by compacted layers of sediment deposited from surface waters during the accumulation of a coal-forming vegetable debris, or during short periods of submergence, followed by emergence, and further vegetable accumulation.

These processes result variously in the interpolation in the coal seam of layers of slate, splint, or bone coal, according to the distinctness and relative thickness of the successive deposits of organic and sedimentary materials.

Under this head come also such fragments of roof or pavement as have become mixed with the coal in mining.

Impurity from this source will be slight in a hand-pick mine, but may become excessive where coal-cutting machines are employed.

Infiltrated impurities are those which have been deposited in the bed of vegetable debris, after its formation, from either suspension or solution in the percolating water; *e.g.*, calcite, baryta, iron oxide, phosphates, arsenides, etc., and notably sulphur, which usually occurs in one or more of three forms, viz.:—

1. Sulphides, chiefly sulphide of iron or pyrite.
2. Organic sulphur.
3. Sulphates, chiefly sulphate of lime, or gypsum.

Pyrite is formed by the reduction of ferrous sulphate in the percolating waters, or by the action of sulphuretted hydrogen in those waters, on ferric hydrate previously precipitated. Pyrite occurs as pseudomorphs, balls, lenses, plates, crystals and scales.

Under organic sulphur we include a number of imperfectly understood compounds of sulphur with carbon, hydrogen, oxygen and nitrogen, formed by the direct action of sulphuretted hydrogen on the decaying vegetable matter.

Sulphates are not so commonly met with, but both pyritic and organic sulphur co-exist in greater or lesser amounts in nearly all coals. As will presently appear, the distinction between the organic and pyritic forms is of gravest import in coal-washing.

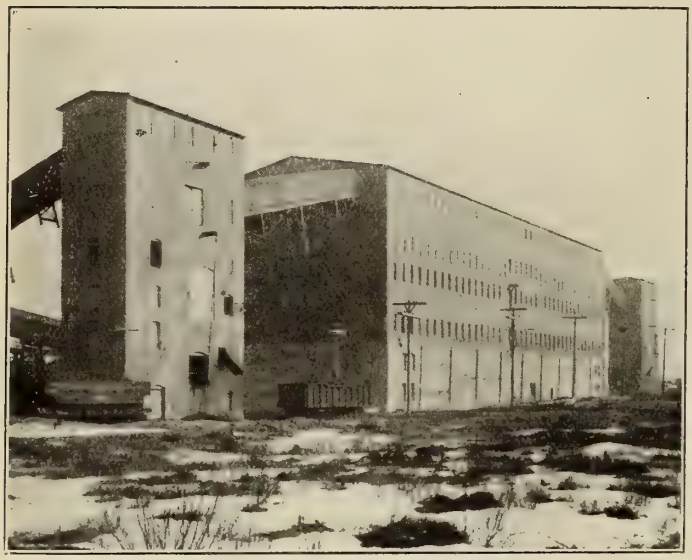
The most usual test for impurity in coal is a simple determination of ash and total sulphur. The ash includes all silica, alumina, iron, lime, magnesia, phosphates and other earthy matters present in the coal. In the absence of notable quantities of phosphorous or arsenic, such a test suffices. If there be a washing problem on hand, pyritic and organic sulphur must be separately determined.

To appreciate the effect of the various impurities in the blast furnace, we must briefly trace their history in the coke oven. Here we find:—

1. That all the ash of the coal, and practically all sulphur present as sulphate of lime, barium, etc., are retained in the coke.

2. That all pyrite is broken up according to the equation $FeS_2 = FeS + S$; half of the pyritic sulphur remains in the coke, and half passes off with the volatile matter.

3. As to the organic sulphur, authorities disagree. Some maintain that it practically all remains behind in



General view of Coal Washer, Dominion Iron and Steel Co., Limited Sydney, N.S.

the coke. On the other hand, it is averred by others that all such sulphur is volatile. It is probable that neither of these contentions is wholly correct in any instance.

A. L. McCallum, in a paper recently read before the Dalhousie Journal Club, of Halifax, described some experiments performed by him upon certain Cape Breton coals. His work clearly shows that, at least in the case of the coals in question, a part of the organic sulphur is always volatile; that, as the percentage of organic sulphur increases, its volatility also tends to increase, that the proportion of it volatilized is practically never more than one-half, and nearly always much less than this.

It is customary, in practice, to assume that half the coal sulphur persists in the coke, for the reason that no coal containing more than very small percentages of organic sulphur is ever used in the coke oven.

Keeping this in mind, we obtain, by means of a crucible test, the approximate coke yield of the coal under consideration, and from the percentages of ash and sulphur in the latter we calculate the ash and sulphur content of our coke.

II.—The question as to what constitutes an excess of coal impurity can now be answered by a similar inquiry regarding coke. The ideal coke would contain neither sulphur nor ash. Such a coke is, of course, not commercially available.

As to what constitutes a prohibitive percentage of ash, two facts must be borne in mind; that increment of silica and alumina in the ash requires a corresponding added increment of flux and fuel in the blast furnace, and causes a proportionate increase in the ratio of slag to iron produced; and that all ash, whatever its analysis, is a diluent—it decreases the calorific power of the coke, and, moreover, eventually weakens the coke structure. The whole question is one of economy. A blast furnace is nearly always located with reference to a definite ore supply. Flux of reasonable purity is so widely distributed that it is seldom a determining factor in the calculation. The furnace, then, must be viewed as a producer of iron and slag. The quantity of impurity in the ore is fixed; local conditions will largely determine the economic limit of the slag—iron ratio; and from these data, and a consideration of the sulphur content of the charge, the maximum amount of coke ash permissible in any case may be calculated. Only under the most favorable conditions can a coke with much over 11.00 per cent. be economically employed.

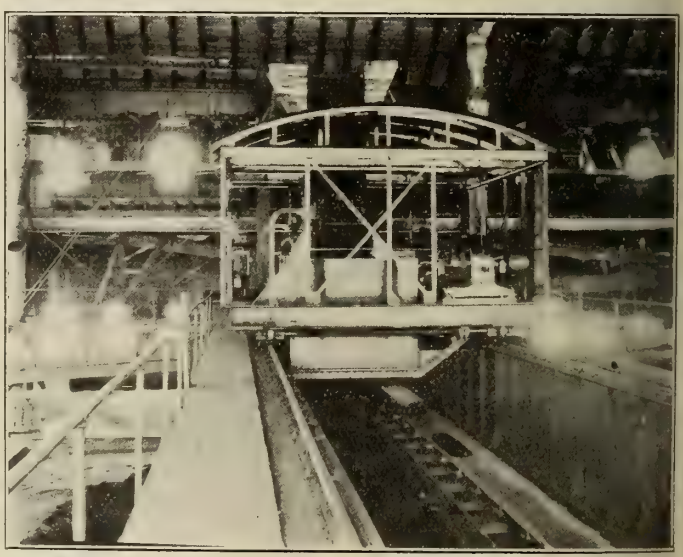
The limit of sulphur, the "blower's bane," is easy to define. A discussion of the deportment of this element in the blast furnace would lead us too far from the subject in hand. Suffice it to say, that it would be below 1.00 per cent., the farther the better, and should never exceed 1.50 per cent.

III.—Experiments made upon coke with a view to reducing its sulphur content have proven signal failures, as perhaps might have been anticipated. We therefore return to a consideration of the coal.

All coal-washing operations are more or less elaborate forms of gravity separation, and depend directly upon differences in specific gravity between coal and its associated minerals. To illustrate: Suppose that we have for examination a one-ton sample of mine-run coal, whose suitability for metallurgical purposes we desire to ascertain. We find that it contains pure coal, bone coal, slate and pyrites. We make several careful determinations, and find that the average specific gravities of these various constituents are, in our particular sample:—

Pure coal	1.29
Bone coal	1.50
Slate	2.43
Pyrite	4.90

The impurities appear, perhaps, to be very intimately associated with the coal; moreover, some of the bone coal



Washed Coal Elevator. The suspension rods and troughs o one battery of tables appear in the upper background. Dominion Iron and Steel Co., Limited, Sydney, N.S.

can be differentiated into more or less pure coal, and more or less carboniferous slate. We therefore crush our sample so that it wholly passes a three-eighth inch screen, or to whatever degree of fineness may be necessary to unlock the impurities. From this ton lot of

crushed coal we select a four or five pound representative sample, weigh it carefully, and place it in a two-thirds gallon cylindrical jar, preferably of glass, which has previously been almost filled with a calcium chloride solution of density slightly greater than that of the pure coal and less than that of all the other constituents (e.g, of 1.30 sp.g). We briskly stir the contents of the jar, and allow to settle. The sample is now found to be

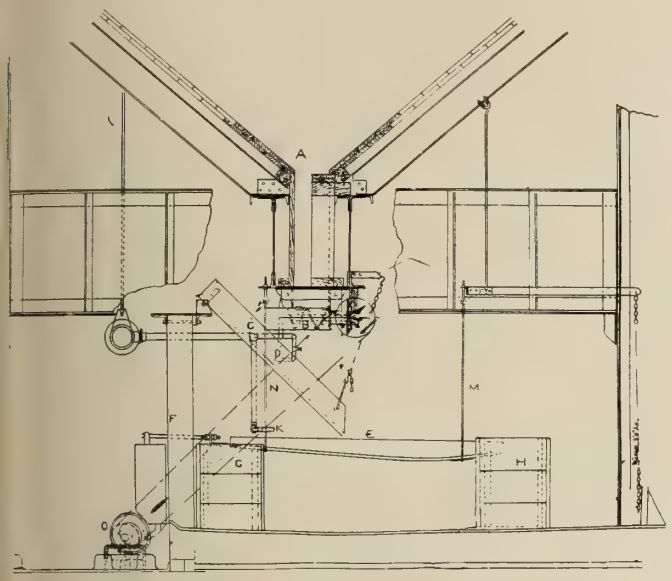


FIG. 1. GENERAL ARRANGEMENT OF CAMPBELL COAL WASHER.

sharply divided into two main portions. All particles of a specific gravity less than 1.30 have floated, while all particles heavier than this have gone to the bottom. Between these two layers there remains suspended in the solution certain particles, negligible in aggregate, whose specific gravity is about 1.30.

Floating and sinking portions are separately removed, placed on draining cloths, washed free of calcium chloride, dried, weighed, and analyzed for sulphur and ash. From the data so derived we calculate the purity and yield of the floating portion, or "washed coal," obtainable from the original lot of mine-run coal. This is the simplest and most effective coal-washing operation that can by any means be performed.

The results of such an experiment determine absolutely for any coal the maximum purity of the washed coal obtainable from it by any process whatsoever. Two very obvious inferences give us at once the answer to our third question.

(a) Only such impurities can be removed as are capable of being disassociated from the pure coal by crushing or other mechanical means.

(b) Any impurity whose specific gravity is not materially greater than that of the pure coal will inevitably persist in the washed coal.

Referring now to the various coal impurities already described, it is clear (1) That innate impurities can never be washed out. Therefore, as a very general rule, washed coal must contain at least 2.00 per cent. of ash. (2) That all sedimentary and infiltrated impurities, being heavier than the coal, are removable to just such extent as they can be differentiated by disintegration. (3) That organic sulphur, which is held in combination in the coal proper, and whose compounds are of like density with the coal, cannot be removed by any washing process. In view of this, the importance of a knowledge of the nature of the sulphur content becomes too obvious to need remark. Thus much for qualitative results.

In describing the calcium chloride experiment, we assumed the dividing line between constituents of different gravities to be sharply drawn. Though this in many cases is reasonably near the truth, it not infrequently happens that, however thorough the disintegration, there remain many particles, which are mixtures of coal and impurity in all proportions, so that there are representatives of every degree of specific gravity between that of pure coal and that of slate. Such particles all sink in a solution of 1.30 sp.g., and much good material is thereby lost in the "sludge." If we substitute a solution of 1.35 sp.g. many of these mixed particles rise to the surface and become washed coal; and we thus get increased yield, with decreased purification. In the same way, if the density of the solution could be definitely raised, we might go on obtaining progressively greater yields of continually diminishing purity until, with a yield of 100 per cent., the whole sample floated and the purification became nil.

However pure it may be, unless the floating portion constitutes a reasonable percentage of the raw coal, the economy of the process becomes doubtful. In the case of coals, therefore, whose impurities can not be sharply differentiated, it may be advisable to sacrifice quality to quantity to an extent which, for each separate instance, must be determined by the economic conditions. These remarks, be it well understood, apply strictly to ash, and then only within very narrow limits.

With sulphur, there must be no compromise. As a matter of fact, sulphur, if removable at all, is usually easily and economically removable, and calls for no compromise.

Unfortunately, the calcium chloride separation, though a beautiful laboratory method, and invaluable as a sure indication of the possibilities of a coal, is too slow and costly to be commercially applicable. Some cheaper and more practical separating medium must be substituted, and we find that water is almost universally employed in this capacity Air has also been utilized to a limited extent. Water being less dense than coal or any of its

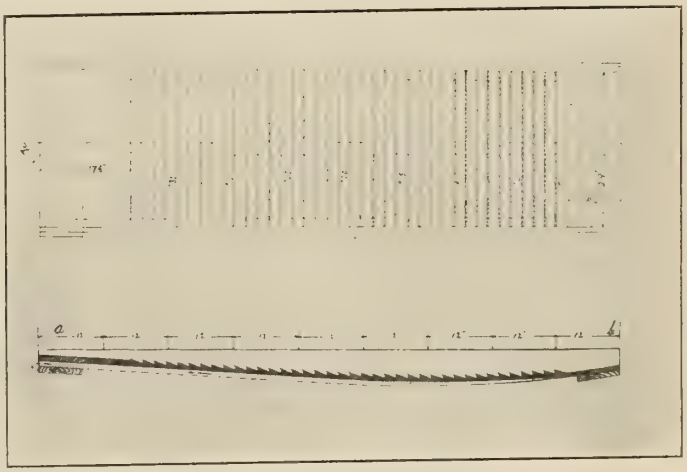


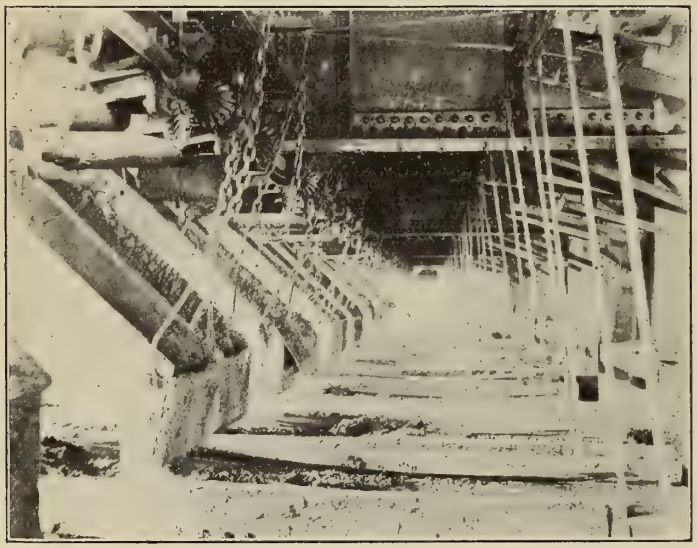
FIG. 2. CAMPBELL TABLE PLAN AND SECTION.

ordinary impurities, does not give, like calcium chloride solution, a positive separation of the constituents, but, since all particles sink, a relative separation, depending upon the different rates of fall of the heavier and lighter particles.

Laws of Settling.

The rate of fall in water, *i.e.*, the "settling velocity" of any particle, depends upon its gravity and upon its size and shape.

I.—Of two particles of the same size and shape, the heavier will settle faster than the lighter; consequently, if a number of fragments of pure coal and slate, of identical size and shape, be simultaneously dropped into a



GENERAL VIEW OF CAMPBELL COAL WASHING TABLE.
Dominion Iron and Steel Co., Limited, Sydney, N.S.

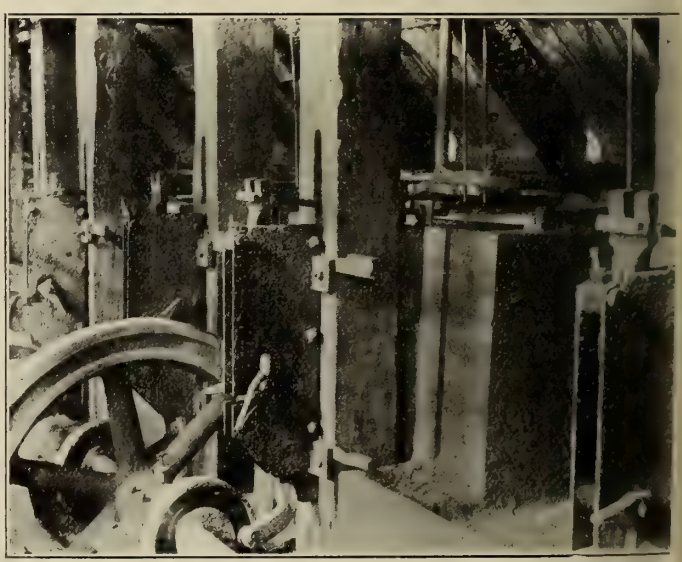
very tall, narrow cylinder of water, the slate reaches the bottom first, and the pure coal last. We have thus obtained a separation according to settling velocities, *i.e.*, according to specific gravity, since the shape and size of all the particles is the same.

II.—Of two particles of the same specific gravity, but of different diameters, the particle of greater diameter has the higher settling velocity. If we repeat the settling experiment, using mixed sizes of slate alone, the largest slate particles will be found to constitute the bottom layer, and the smallest the topmost layer Between these fall the intermediate sizes. Here again we obtain a separation according to settling velocities, and this time the specific gravity of all particles being the same, according to diameters. The same thing is true of mixed sizes of coal alone.

III.—If now we perform the same experiment upon mixed sizes of coal and slate, we still obtain a separation according to settling velocities, but both gravity and size come into play. The largest slate fragments will be found on the bottom. On top of these will be a layer comprising the next smaller size of slate with the largest size of coal, and so on to the topmost layer, which will be found to consist of the very smallest coal particles. However often we repeat this operation, the make-up of each horizontal layer, and its relation in space to the other layer, will in every case be practically the same. We shall also find that the ratio of the diameter of any coal fragment to that of any slate fragment in the same horizontal layer, or, as it is called, the "settling ratio," for these two minerals, is approximately constant for all layers. What has been said of coal and slate applies in the same way to coal in relation to any other impurity that is mechanically separable from it, the settling ratio being greater or less, as the difference in specific gravity which just pass the same screen the round fragments increases or decreases. We therefore generalize as follows:—All particles of the same settling velocity will be found in the same horizontal layer. Of two particles with the same settling velocity, that with the higher specific gravity is of smaller diameter than the other. The ratio between these two diameters, *i.e.*, the settling ratio, is, for any two minerals, constant under the same conditions. With regard to shape, of a number of fragments settle first, the longish ones next, and, last of all, the flat ones.

What is the significance of these settling laws with reference to coal-washing? This: Our task is to separate as completely as possible the coal from the slate or other impurities. From what has been said it is evident that we cannot accomplish this with a mixture of raw-coal fragments of all sizes by any method depending upon settling ratios. It is not possible, or at least not practicable, to reduce all particles to the same size, and so bring our problem directly under Law I. What we can do, however, and must do, to secure reasonably perfect separation, is to screen the coal into fractions such that the settling velocity of the largest coal particle, in any one fraction, is less than that of the smallest particle of impurity in the same fraction. Unless such screen classification precedes the water treatment, complete separation will not be effected. Obviously, the lower settling ratio of coal with reference to any impurity, *i.e.*, the nearer the gravity of such impurity approaches that of pure coal, the closer the sizing must be. Whereas, if the coal be considerably lighter than the lightest impurity, less sizing is called for.

The settling laws are still more strikingly and practically exemplified by means of a "sorting column." This, in its simplest form, is an upright glass cylinder having an inlet at the bottom, through which a gentle current of water at constant pressure is admitted. Coal and slate fragments are allowed to fall into the cylinder



Rear view of Washing Tables, showing spray pipe, false bottom, sludge receiver, bumping post, cam and bumping device. Dominion Iron and Steel Co., Limited, Sydney, N.S.

against this rising current, "the velocity of which" (Richards' "Ore Dressing") "is much less than the free-falling velocity of the particles, but yet enough so that the particles are in motion. Every particle in the mass is poised in the upward-moving water. If a grain above has a greater settling power, it quickly gets below. If one below has less, it quickly rises." The result is a series of layers, arranged similarly to those obtained with

the settling tube. Moreover, so positive is this arrangement that if any particle, having found its own level, be, by some external force torn from its own little colony of co-settlers, it will, when released, return to practically the same group as before. Particles freshly added to a column already so arranged speedily find their proper horizon as demanded by their settling velocities.

A comparison of the layers from such a sorting column, with those obtained from the same coal mixture by means of the plain settling tube, discloses the fact that the coal particles co-existing with a given size of impurity in the sorting column are uniformly of much greater diameter than those consorting with the same size of impurity in the settling tube. In other words, the sorting column gives much higher settling ratios than the settling tube does. This remarkable state of affairs has been shown to be due to the fact that the conditions obtaining in the settling tube are those known as "free settling," *i.e.*, every particle falls independently of all the others, whereas, in the sorting column, the particles are crowded together and each must settle issues, not only with the water, but with its neighbors as well. This crowded condition is described as "hindered settling." Hindered settling owes its superior effectiveness to certain phenomena connected with interstitial fall, which need not here be gone into.

It should be remarked that if the water current of the sorting column be made strong enough to carry the coal particles over the top of the cylinder, and allow only the slate to remain behind, the conditions become those of free settling.

All settling phenomena, as already intimated, are dependent essentially upon gravitation, and the path of the particles through the water is essentially vertical. The same general principles obtain equally when the particles are projected in a horizontal direction through the separating medium. To quote once more from Richards, "when a particle is given a high velocity in a horizontal direction, its path is called its trajectory." Of two particles of the same size and shape, the heavier will have the longer trajectory, and of two particles with different gravities but the same trajectory, that with the higher gravity will be of smaller diameter than the other.

The laws of horizontal travel are exemplified in the bumping table, long used in ore dressing, and more recently introduced, and with great success, in coal-washing.

We shall now briefly consider the practical application of the principles already outlined.

All washing processes must be preceded by a sufficient degree of crushing to unlock the impurities. Insufficient crushing causes a decrease in both yield and purity of washed coal, since larger coal fragments will buoy up small adherent masses of impurity, and, conversely, much pure coal will be dragged down by preponderance of associated heavy material. The general character of the coal and the distribution of the impurities must for each case determine the desideratum in the matter of size. On the other hand, undue pulverization diminishes the purity of the washed product, and should be avoided.

The importance of properly sizing the crushed coal previous to washing has already been touched upon, and from what has been said of settling ratios it will be gathered that closeness of sizing is governed by the nature of the impurity. For pyrites alone, we need not screen very closely. The same is true, in lesser degree, of slate. Thus, the coal-washing plant of the Nova Scotia Steel & Coal Company, Limited, at Sydney Mines, N.S., using Luhrig jigs, lowers the ash in one grade of slack from 13.00-14.00 per cent. down to 3.5-4.0 per cent., using only three sizes—all under 3-4 inch mesh. This they are enabled to do because their ash is almost wholly derived from a good free slate.

On the other hand, the *School of Mines Quarterly,* Vol. XVII., No. 4, describes a Mexican plant where the best results are not obtained until six sizes are made, viz.:— 0 to 1-16 inch, 1-16 inch to 1-8 inch, 1-8 inch to 1-4 inch, 1-4 inch to 3-8 inch, 3-8 inch to 1-2 inch, and 1-2 inch to 3-4 inch. The impurities in the coal operated upon are so interwoven that there are present in the crushed coal particles of all degrees of gravity. Hence the settling ratios are small, and this close sizing is necessitated.

The various existing types of crusher and screen need not here be touched upon. Nor need we repeat the elaborate descriptions of the different coal-washing machines that have from time to time appeared in industrial journals. Each manufacturer naturally claims the palm for his machine, and can usually furnish columns of figures showing the results obtained by it in actual practice. These representations are in most cases, doubtless, fair and correct; but it is to be regretted that they are so seldom accompanied by adequate information regarding the character of the coal operated upon. It should be remembered that for every seam of coal there are certain possibilities as regards purification; that these possibilities, both qualitative and quantitative, can be accurately and positively determined by a series of calcium chloride separations, without the expenditure of a single dollar for coal-washing machinery; that a good washer should come only a little short of maximum possible purity as determined in this way, and that the best machine made can not surpass it.

Coal-washing devices employing water as a separating medium—not including elutriators—may be classified as follows:—

A. Surface current washers.
   1. Water stirred.
      (a) Intermittent, *e.g.*, the simple trough washer.
      (b) Continuous, *e.g.*, the Elliot trough washer.
   2. Mechanically stirred.
      (a) Intermittent, *e.g.*, the Scaife trough washer.
      (b) Continuous, *e.g.*, the Campbell bumping table.

B. Hydraulic washers.
   1. Continuous current, *e.g.*, the Robinson washer.
   2. Pulsating current, *e.g.*, all forms of jig.

The trough washer represents the most elementary effort to purify coal. It is simply a long inclined wooden trough, with perpendicular sides and a flat bottom, across which cleats are fixed at regular intervals. Water and coal are supplied together at the top of the trough. Impurities sink and are caught on the cleats, or "riffles." The water current, regulated by the inclination of the trough, carries the pure coal on over the lower end. At stated intervals operation must be stopped, or the flow of coal and water deflected into a second trough, while the riffles are being scraped out. Such an arrangement, when carefully and honestly tended, has been known to give admirable results.

The Elliott trough is similar in principle, but the fixed riffles are replaced by an endless chain of movable riffles, or rather scrapers, travelling from bottom to top of the trough. The water is admitted at the upper end, and the coal at a point midway between top and bottom. The pure coal is carried over the lower end as before, while the dirt is carried over the head of the trough by the scrapers.

The Scaife trough is an inclined trough of semi-circular cross section, two feet in diameter and twenty-four feet long, with fixed transverse riffles. The trough is longitudinally traversed by a rocking shaft carrying stirring fingers, which aid the water in agitating the coal and settling the impurities. When the riffles are full, coal and water are stopped, the trough is dropped from one side and the refuse dumped. It is then swung back into place, and operation resumed.

The Robinson washer is a wrought iron vat, in the shape of an inverted cone. Vertically in the centre of this vat stands a shaft carrying four stirring arms, whose field of revolution occupies the upper part of the vat. A continuous stream of water under considerable pressure is admitted at the bottom. Coal is fed into the open top. The slate sinks, and is discharged from time to time by means of a pair of sliding gates. The clean coal is carried over the lip of the vat with the water.

It will be observed that all types so far described operate for the most part on a free settling basis.

Under the jigs we include all machines in which the segregation of the heavier and lighter particles is accomplished by a pulsating current of water. The most rudimentary form of jig would consist of a box, with screen bottom and open top, sliding freely, with a minimum clearance upwards and downwards in an outer box filled with water. Coal, screened to the desired size, is charged into the inner box, which is then moved sharply downwards and upwards in the water by means of suitable cranks and driving rods. On the down stroke the water from the outer box rises through the screens and forms a sorting column, in which the coal and impurities are arranged according to their several settling ratios under hindered settling conditions. This phase is known as pulsion. When the inner box is raised again the water retreats from it, giving rise to the alternate phase of suction (which, by a suitable arrangement of valves, may be replaced by an interval of rest). If now we steadily supply raw coal to one side of the inner box, and continue the alternations of pulsion and suction, the operation becomes a continuous one, the pure coal is crowded over the lip of the inner box on the side opposite to the feed side, while the slate may, in any one of several ways, be continually removed from the bottom. Exactly the same result may be arrived at by fixing the sieve and causing the water to pulsate by means of a suitable arrangement of plungers. Numberless varieties of jig, mainly of the fixed sieve type, are manufactured and successfully employed in coal-washing. The most important differences are in the control, in the manner of removing the sludge, and in the arrangement of the jig bed, both in itself and with reference to the other beds. They are all only more or less complicated exemplifications of the laws of hindered settling.

Any size of particle may be treated in a jig, always provided, of course, that the particles jigged at the same time are of the uniformity prescribed by the settling ratios. For large fragments, a long, slow stroke is required; for smaller ones, a shorter, quicker stroke, *e.g.*, for coal passing a 1 1-2 inch screen and stopping on a 1 inch screen, 60-90 alternations from 2 inches to 3 inches in length are necessary per minute, while for sizes from 1-16 inch to 1-8 inch, about 140 alternations of a length from 3-8 inch to 1 inch would be required.

It remains now to describe the Campbell bumping table, a coal-washing device which, in seeming contradiction of all that has been said of the laws of settling, completely does away with the need for preliminary sizing. The contradiction, however, will be seen to be apparent only.

The *modus operandi* of the Campbell table will perhaps be best explained by a reference to the coal-washer of the Dominion Iron & Steel Company, Limited, of Sydney, N.S., where this type of washing machine has been successfully employed since September, 1904. The first of the accompanying illustrations shows the washery building, with the breaker towers at either end. Each tower contains a Bradford breaker and a roll crusher. The Bradford, as here installed, consists of two concentric drums, revolving about a horizontal axis. The inner drum is a screen, eight feet in diameter, and cylindrical in shape. Its meshes are one inch square. The outer drum has from feed to discharge end a gradually increasing diameter, with a mean of eleven feet, and is perforated with 3-8 inch round holes. The interior wall of the inner drum is provided with cast iron fingers, arranged in spiral rows. Mine-run coal, conveyed by belt from the receiving bins to the top of the tower, is fed into one end of the inner cylinder. As the breaker revolves, the pure coal, completely shattered by its own fall, passes wholly through the inch screen into the space between the two drums. All coal stopping on the 3-8 inch round holes is sent to the rolls, which are set at 1-8 inch, and thence to the washer bin. All coal passing the 3-8 inch holes goes to the washer bin direct. The larger fragments of slate, splint and pyrites, on the contrary, remain for the most part unbroken, and, aided by the arrangement of the cast iron fingers, are presently shot out at the discharge end of the inner drum as "breaker coal." The breaker, therefore, besides disintegrating and to a certain extent classifying the coal, effects a preliminary purification which is a very valuable adjunct to the washing.

Thus, a coal of the character operated upon at Sydney, contains as it enters the breaker, perhaps 6.50 per cent. ash and 2.50 per cent. sulphur. It leaves the breaker tower as a crushed coal, with perhaps 5.00 per cent. ash and 2.00 per cent. sulphur.

This is one of the reasons why mine-run coal is preferred in such instances to bankhead slack, which, besides containing higher initial sulphur and ash, cannot be benefited by the breaker, but must go straight to the washer without preliminary purification.

The washer proper comprises two independent units, each consisting of a battery of 24 bumping tables, arranged side by side, in line—a crushed coal bin extending over the entire length of the battery—water tower, sludge tanks, two concrete draining bins for washed coal, washed coal elevator, and conveying belts and accessories. Each unit is fed from its own breaker tower, and has a capacity of about 100 tons of washed coal per hour. A fair idea of the operation is given by Figures 1 and 2, which, although diagrammatic, are reasonably accurate as to scale.

E.—Fig. 1—is the table proper, shown in more detail in Fig. 2. The table is suspended from two pairs of rods, N and N, so that it swings freely in a practically horizontal plane in the direction of its long axis; and, being actuated by the cam arrangement O, is caused to bump against the post F.

The crushed coal falls steadily from the bin A through a vertical chute to the screw conveyor B, which delivers it into the trough C. The coal feed is controlled by the speed of the screw conveyor, and by a sliding gate in the chute just above B. In the trough the coal meets a stream of water from the supply pipe D, and, thoroughly mixed with it, falls upon the table. The water supply is further augmented by the spray pipe K, which, by means of a deflector, throws a fan-shaped stream across the width of the table.

The table is just sufficiently inclined towards the coal receiver H to determine the water wholly in that direction, but not enough to enable the water of itself to carry the coal over with it, *i.e.*, if the bumping stops the water still flows to H, but the coal settles on the tables. The bumping of the table against F throws all the heavier particles of impurity, against the water current, towards the sludge box G. At the same time, at every bump, the water on the table is carried backward, part of the way towards the sludge end, stirring the coal thoroughly, and on its return flowing over the coal end in sufficient volume to carry the pure coal with it to the receiver H, whence it is conveyed in sluices to the draining tanks.

These broad statements regarding the performance of the table upon material not closely sized will now be gone into a little more fully. The table (Fig. 2), which may be considered as a trough of varying depth, with perpendicular side walls and open ends, is 29 inches wide and 9 feet long. Beginning at the right hand (which in the sketch is the washed coal end of the table), is a tail board 10 1-4 inches wide, whose length is the width of the table. This is followed by 37 riffles, of the form shown in the longitudinal section (Fig. 2). The body of the riffle is of wood, with a projecting edge of galvanized iron. Following the riffles is a head board, 17 1-2 inches wide. Riffles Nos. 1-29, inclusive, are open riffles, *i.e.*, they are set about 3-32 inches apart, leaving between each riffle and its neighbor a slot which communicates with the space between the bottom of the riffle, and the false bottom C, of galvanized iron. This space, as shown by the arrows, opens on the sludge end of the tables. Nos. 30-37 are closed riffles.

The rationale of the operation is as follows: The stream of coal and water from the trough C (Fig. 1), strikes the tables about riffle No. 25. The bumping promptly imparts to each particle on the table an impulse towards the sludge end. Only the heaviest particles, however, can cope with the water, whose prevailing tendency is towards the coal end. As a result, the coarser impurities are caused to migrate to the sludge end of the table in a series of hops, which are shorter or longer, according to their size. Behind them, in the species of settling basin formed by the greatest depth of the table, a three-cornered arrangement goes forward between the coarse coal, the fine coal and the fine remnant of impurity. Every particle upon the table strives, by virtue of its gravity, to come to rest in the riffles On a perfectly fresh table the coarsest coal may possibly for a short time be on even terms with the impurity, but only a few fragments of the former are necessary to fill the riffles once and for all, and after the first few moments all additional coarse fragments are crowded out and must, perforce, move on. The fine coal particles, unable to sink in the briskly agitated water, are carried over into the coal received. Only the fine impurities, settling in the interstices of the coal, are caught by the iron edge of the riffle, ooze through the slot, and, falling upon the false bottom, make their way back unopposed to the sludge receiver.

Tests were made some months ago upon one of the Dominion Iron & Steel Company's tables, with a view to gathering some general information with regard to what might be termed the "ballistic ratios" of coal with reference to slate, etc., under working conditions. While the table was in regular operation a number of fragments of coal and marble of assorted sizes were dropped among the coal and water in the trough, and their deportment was observed. Marble was chosen, because its gravity is not very far from that of slate, and because of its distinctive color. The various experiments were repeated times enough to eliminate chance error, and it was proven:—

1. That every pure coal fragment weighing not more than 125 grams. (sp.g. 1.29), went regularly over the coal end. Slightly larger pieces still went to the coal end, but stuck in the shallow part of the table, about riffle No. 2. Still larger sizes travelled towards the sludge receiver.

2. That all limestone fragments stopping on a sieve of 10 meshes to the linear inch found their way to the sludge end, while smaller particles sank in the riffles, or at least did not come over the head board during the period of observation.

3. An examination of the sediment in the various riffles showed that all pyrites stopping on a sieve of forty meshes to the linear inch had been thrown over with the sludge, and that practically all pyrites finer than this, and all except the finest of the slate, had fallen between riffles 17 and 8, at the deepest part of the table, while the remaining riffles, 7-1, rising towards the coal end, retained the last of the slate, the contents of the last riffle consisting chiefly of pure soal.

Numerous comparisons of the regular work of this machine, with the results of calcium chloride separations made on concurrently taken samples of the same crushed coal, showed the work done day by day to be almost ideal, both as to quality and yield of product.

Equally successful work could, of course, be done with any good jig washer if the screening were sufficiently close; but screens wear rapidly, and, in spite of the most careful watching, the mesh becomes gradually larger and the sizing ineffective, so that, strictly speaking, maximum efficiency is only obtained when all the screens are perfectly new.

In the case of the bumping table, no such difficulty presents itself. The table has a long life and requires little in the way of repair, all the variables are under practically perfect control and can without difficulty be maintained constant.

In short, once regulated, the washer is doing its best work if it is running at all.

We have thus endeavored to treat, in a very general way, a few points suggested by the questions we originally propounded, laying emphasis on some details which are too often overlooked; and, in conclusion, while admitting that laboratory reports on industrial processes are often of doubtful and even negative value, we nevertheless venture to hope that the laboratory investigation of coal, as a determinant of its possibilities in the way of purification, may in future obtain more nearly its meed of appreciation.

In Cumberland, England, coal seams under 4 feet are worked almost exclusively by long-wall, and seams above that thickness by bord-and-pillar. However, the long-wall system has been adopted in several of the thicker seams, and it may be used in all cases where conditions are favorable. The yield is larger by long-wall and a higher percentage of round coal is obtained. The thickest seam at present worked by long-wall is 5 feet.

In France collieries are not worked on the pillar-and-stall method. The pillars are always taken out in their entirety, so that no coal is left in the workings; but during the first working "in the whole" the Mine Administration may require that the size of the pillars be increased.

PROSPECTING IN UNGAVA

J. C. Murray.

(Continued from page 112.)

An examination of Cotter's Island, the most northerly of the Nastapoka group, completed our summer's work. It had been arranged that we should meet the steamer "Algerine," carrying our winter supplies and building material for our winter quarters, about September 5th, at a point sixty or seventy miles north of Bell's Harbor. It was now the 5th of August. We had, therefor, ample time to sail up to the Hopewell Islands, choose our winter quarters and then run still further north on a short exploring excursion. On August 7th we anchored in Hopewell Sound, near the mouth of the Kongut River. Investigation of the surrounding country led to the choice of a spot on the north bank of the Innuksuak River, as a suitable location for putting up our buildings. In our ramblings here we came upon patches of blueberries growing on miscroscopic bushes.



LANGLAND RIVER FALLS.

After a short cruise north beyond Cape Dufferin, we returned to Innuksuak River on August 17th. Here we laid out the ground for our winter home and began excavating. Our only tools were gold pans and drill steel. However, the soil was loose and sandy, and we made surprising progress. By the time the foundations were well under way and a landing stage, built of flat stones carried by boat from an island five miles distant, was completed, the steamer "Algerine" appeared, ten days ahead of schedule. This was August 25th. By August 29th lumber, provisions, fuel and all sundries had been removed from the "Algerine," and we had dimensions 33 feet by 17 feet, which was to be our dwelling, and another of 30 feet by 16 feet, to become mately our storehouse.



UNLOADING WINTER SUPPLIES AT PORT HARRISON.

The "Algerine" left us on August 31st, taking one of our party along with her.



WINTER QUARTERS—PORT HARRISON.

The middle of September saw our large dwelling house almost completed. By early October a small laboratory, a kitchen (both opening into the main dwelling), a large storehouse, a dwelling for the Eskimos, a substantial workshop and one or two small outhouses were entirely furnished. Our three Eskimos displayed extraordinary skill in carpentry, easily excelling our own poor efforts. As may be supposed, we did not observe union hours during construction.



THE YACHT "ALLE."

The autumn was abnormally mild. Not until September 30th did the thermometer drop to freezing point. Early in September waveys appeared, flying south in

large flocks. Our Eskimos replenished our larder with many of these edible birds. Delicious salmon trout, firm of flesh and delicate of flavor, were caught at the river mouth in abundance. White owls, also, were often on our bill of fare. These birds were captured by a singular device. Short posts were driven into the ground at some distance from the dwellings, and on these were set No. 2 steel spring traps without bait. The owls, in their delight at seeing a possible perch in that treeless country, flew literally into the trap. The flesh of these birds is sweet and entirely pleasant. Ptarmigan were shot by the dozen, and so throughout the autumn we fared sumptuously.

Early in October we hauled our yacht out of water and housed her in. In November, analytical work was started in the laboratory. As winter had now set seriously in, making ample amends for the mild autumn, it was necessary to move all the re-agents that would be affected by the cold, out of the laboratory at night



TENT OF ESKIMO CHIEF, KOMINWAK.

and place them in a small frostproof cellar. Iron ore samples, taken during the summer, were crushed in a small hand-power jaw crusher, ground to uniform size and analyzed.

The absence of several important re-agents made one or two analytical operations very cumbersome However, many iron, manganese, silica and sulphur determinations were performed. Numerous qualitative examinations were also conducted. Later in the next spring we made a long series of gold and silver assays, using a small gasolene tank furnace.

In the first week of December our Eskimos banked the dwelling house. They cut huge blocks of snow and built them carefully about the house as far as the eves of the roof. Several families of northern Eskimos had now settled in their snow-houses near us. On Saturday evening they gathered in the main room to hear the phonograph. Eskimos were constantly calling at our post on their way north and south. The season was a phenomenally good one for foxes, and already much bartering had been done. White foxes were so plentiful that it was not at all uncommon for four or five to be trapped in an afternoon within a few miles of our winter quarters.

Our winter days, under the direction of our leader, were carefully filled with work, exercise and amusement. Drafting, laboratory work and compiling notes usually occupied the mornings. In the afternoon we took long runs on skis, sometimes after ptarmigan, more often after fox. The evening was devoted to reading, writing and occasionally to bridge whist. Plenty of good food and a great deal of outdoor exercise kept us cheerful and healthy. During bad weather in January, 1902, when extended travel was impossible, we took our exercise by tunnelling for many yards in a huge snowdrift that had formed on the north side of our dwelling.

In February a micrometer survey was made of the shore line about our post, which we had, incidentally, christened Port Harrison. February proved a much milder month than January. The average temperature during December had been 1 degree below zero. January's average was 12 degrees below zero, with a maximum of about 54 degrees below.

We had last heard from civilization in August, when the steamer had brought us letters that had been written in the previous June. Now, March 14th, an overland dog-packet came in from Great Whale, a long and arduous jurney, carrying very welcome letters, written to us many months before.

On March 15th two of us started south in dog-sleds for Nastapoka Islands, to finish surveying and locating claims.

(To be continued.)

The McMurtry-Rogers Process of Desulphurizing Copper Ores and Matte

Communicated by T. C. Cloud, Member.

(A Paper read before the Institution of Mining and Metallurgy, London, Eng., April 18th.)

The ore may be of any size from 2 1-2 inch gauge down to fine slimes, but preferably the largest pieces should not exceed 1 inch gauge, nor is it advantageous that the charge should consist entirely of slime ore.

The charge must contain silica or silicious material amounting to from 15 to 35 per cent. of silica and from 15 to 25 per cent. of sulphur, but the precentages of these substances may be somewhat greater or less without very materially affecting the operations of the process, it being also essential that the charge is wetted.

With ore direct from a dressing plant the amount of water present is usually enough, but when deficient the charge can be wetted while being mixed, or while being charged into the converter; enough water should be added to make the material cohere when slightly pressed.

From experience gained in working the process, the charges which burn best consist of—roughly—one-third of pieces about 1 inch to 1 1-4 inch gauge and two-thirds of fine ore from jigs, buddles or tables. When jigged ore and slimes, or slimes only, are treated, the charges take longer to burn.

The converters used for burning the ore, which have been installed at the Wallaroo Works, are cast iron pots mounted on trunnions and inverted by means of a worm and wheel, the inside diameter being 8 feet 8 inches by 4 feet 6 inches deep, the false bottom slightly convex and placed about 10 inches from the lowest part of the converter; it is perforated all over with 5-8 inch holes. Originally these false bottoms were made of cast iron, but it was found better to use wrought iron plates,

strengthened with angle irons underneath, these bottoms being held in position by a bolt passing through the centre of the pot.

The blast pipe enters at the back of the pot under this false bottom and is 8 inches in diameter.

Such a pot would hold eight to nine tons of wet ore.

The *modus operandi* consists in first covering the false bottom with pieces of a previously burnt charge broken to from 3 to 4 inch size, then lighting a small fire in the middle of the pot on top of this burnt material, using a light blast to urge on the fire, then charging the ore on top of this fire till the pot is about half full; after increasing the blast, and when the ore becomes more or less red in several places, the balance of the charge is added till the pot is full.

To start the fire a few chips of wood kindled by any ordinary means are used, and when these are burning well, sawdust is charged in on top till the whole fire is covered, allowed to burn a short time, then more sawdust is added wherever the fire appears.

By starting a small fire in this way in the middle of the pot and slightly coning up the sawdust, it drives the fire out in a circle towards the edges of the pot.

When the ring of fire has reached about one-third to half the diameter of the pot the ore is charged in on top, the first being put on with a shovel, so as not to scatter the fire too much, but after a layer has covered the whole of the bottom the ore is then fed in by an elevator from the feed bins below, being spread by a man over the surface in such a way that when the pot is half full the ore is piled up more at the sides than in the middle, presenting a concave surface; the reason for this being that the fire has a tendency to make for the sides rather than up through the middle.

For some time coal was used, or a mixture of coal and fine coke, but sawdust was found to answer better, as the fire was not so hot.

When the pot is about half full and the charge distributed as stated, a number of holes are pricked near the centre, a slight distance down into the charge, with a 1-2 inch rod; the object of this being to give more or less free vents for the uncombined sulphur and sulphur dioxide to escape and so quicken the burning.

These holes must be closed in before the fire burns through, otherwise blow-holes would be formed; the man in charge soon learns to tell when the fire is getting near the top of any hole by the color of the smoke given off.

During the spreading of the charge the blast is usually turned off to enable the man to work comfortably, and after the holes have been pricked half blast is given for about an hour, being then increased to full pressure.

The full pressure of blast used is 13 ounces, but it can be largely increased if necessary; over 20 ounces has been used, which latter pressure quickens the time of burning. The volume of air used per minute at this pressure for each pot is about 1,000 cubic feet.

Each pot has to be covered by a hood in order to take off the fumes, a connection being made from the hood to a flue, or a large pipe taken out from the top of the hood through the roof of the shed.

When the evolution of sulphur dioxide slackens and the charge has become red hot throughout, the blast is turned off, the blast pipe disconnected and the converter inverted.

In order to break up the sintered material more readily the cake is allowed to fall on some four or five cast iron cones, which help to split it into smaller pieces; these being subsequently cooled on the outside with water, and further broken up to a suitable size for smelting operations.

When the cones are not used the cake as a rule turns out of the converter in one solid block weighing over six tons (with the exception of a little loose unburnt ore on the surface), and even the fall to the ground is often not sufficient to break it.

The time taken to burn a charge varies with the mixture of ore used, but eight to twelve hours is the usual time. If the charge contains fully one-third of its bulk in pieces of 1 inch to 1 1-4 inch, well distributed, the time is often eight hours or under, but, as previously stated, with all fine material a longer period for burning is required. Like all converter pot processes, it pays to have the burning well looked after, to see that the blow-holes are stopped as they form, and also to allow as many holes as possible for the escape of free sulphur; by looking after these two points the time of burning can be materially reduced.

The shape of the converter pot has something to do with the successful burning of the charges. The first large pot used for experimental purposes was an old lead refining kettle with a hole at the bottom for the blast and a false bottom about 2 feet 6 inches diameter.

In burning ore charges in such a pot the difficulty was to get the ore near the sides alight, and in order to help this, sticks of wood about 18 inches long were put into the charge when the pot was a little over half full, radiating from the centre towards the sides; these as they burnt formed holes for the air to come up and so cause the ore near the sides to burn; with the proper pots installed for the ore treatment the sides are very much straighter, being for some distance at an angle of 14 degrees only from the vertical, and no sticks are required with them.

The product obtained consists of a porous sintered mass of ferrous silicate containing shots of rich copper regulus and free silica (ferric oxide only being observed on the outside of the cake), and forms a most suitable material for blast furnace treatment; the bulk of iron being in the ferrous condition renders it fit for slag formation without having to be first reduced from the higher state of oxidation.

The difficulties in treating fine-dressed ores of copper by first calcining and then smelting are well known to copper metallurgists, one of them being the heavy mechanical loss which occurs in the calcining operations, and again in the charging of the reverberatory furnaces with the hot calcines; true, these two sources of loss can be minimized by the use of good dust chambers and long flues, but even then the flue dust is not the easiest thing to re-treat.

Another difficulty is that the calcined ore is not suitable for smelting in a blast furnace, so that reverberatories must be used if there is much of this material to be treated, and in large works the two methods of smelting are frequently employed; the blast furnace for the rough ore, and the reverberatories for the fine.

These two difficulties are overcome by the use of the sintering process, as the loss is small owing to the ore being wet; the only time any dusting occurs is if a blow-hole is allowed to go unchecked, and this is seen at once and can be stopped; then the product can be smelted in either a blast furnace or a reverberatory; with the latter, however, it has to be broken up smaller than for a blast furnace.

The elimination of sulphur is as good as is obtained by most calcining processes for copper ores, and if the sintered product were smelted alone, without the addition of some uncalcined ore, the regulus produced would be too high for good work.

The result of a sample from a large pile waiting for blast furnace treatment gave 5.65 per cent. of sulphur; other results have given under 5 per cent. of sulphur from raw ore containing about 20 per cent. of sulphur and 10 to 12 per cent. of copper.

The presence of lime or compounds of lime is not essential to the working of the process.

The first experiments were made during 1904, and at the present time the plant which has been installed at Wallaroo is treating from four to five hundred tons of ore a week. At this point mention should be made of the help received from one of the writer's metallurgical assistants, Mr. S. Radcliff, in making the process the success it is at present.

The cost of desulphurizing by this process, including the cost of breaking up converter product for smelting, is only slightly higher than that of calcining rough ore of similar composition in pyrites burners.

Regulus or Mattes.—In treating these products the addition of some silicious material is necessary in order to take up the iron contained and form ferrous silicate; the proportions to be used are, preferably, from 15 to 25 per cent., but these may vary considerably. The silica may consist of such materials as coarse sand, jigged tailings, silicious carbonate ore, silicious oxide ore, and even silicious sulphide ore, such as dressed ore from buddles and Wilfley tables, has been used. The regulus should be crushed to pass a screen with meshes of from 1-2 to 3-4 inch square; with some mattes the larger screen should be used, but with hard low grade mattes it is better to take the 1-2 inch size.

The silicious material must be well mixed with the crushed matte or regulus, and the whole wetted to the same extent as with the ore.

In actual work it has been found better to take more trouble in charging the converters than is necessary in the case of ore, the best method being to add a few shovels full at a time over any part of the charge where the fire is showing through, until the pot is full.

The starting of a regulus charge does not need as large a fire as in the case of ore, and very good results were obtained by using the lead kettles previously mentioned for this work, starting the fire with a little wood and sawdust on the top of the rough pieces of burnt material; the pots which are in use for the burning of rich regulus or "regule," to be subsequently described, were also found to give very good results in matte burning, as the product, being smaller, was easier to break up than the large cakes obtained from the lead kettles.

With matte it is not necessary to prick holes in the charge, there being no free sulphur to eliminate unless sulphide ore is used to mix with the matte.

The product of the reaction is normally ferrous silicate, with a little monosulphide of iron and sulphide and silicate of copper.

A little metallic copper may be formed owing to reactions occurring between oxides of copper and sulphide of copper.

When the charge contains a moiety of oxidized ore, a fair proportion of copper is reduced to the metallic state; this, however, does not decrease the speed at which the desulphurization takes place.

The blast used must not be too high, 6 to 8 ounces being enough at first, as the lower layer next to the fire is apt to run up to too high a temperature if a greater pressure is maintained at starting; the pressure can, however, be increased towards the end to the same extent as with the ore.

The product after inverting the converter may be broken up and melted down in any suitable furnace, with the production of a very rich regulus and more or less metallic copper.

Owing to the difficulty of sampling such a product, and to the fact that some of the sulphur is in the form of sulphate, which in melting reacts with unchanged sulphide, no assay was done for sulphur in this product, but the result of the work is soon seen when the material is smelted, and gives a better guide than any assay would.

On burning matte assaying 25 to 30 per cent. of copper with one-third its bulk of silicious slimes, the product on melting gave regulus assaying from 64 to 67 per cent. of copper. With richer mattes the result was better, and in most cases it was necessary to add a certain amount of raw matte to the charge in order to keep the regulus produced on melting only just over 70 per cent.

Using the lead kettles as converters, a charge of from 6 to 7 tons of a mixture of matte and silicous material could be burnt in nine hours, and at times three six-ton charges were treated in twenty-four hours per pot, or eight hours each.

"White Metal" or "Regule."—The most satisfactory results obtained were with "metal" assaying from 78 to 80 per cent. of copper, that grade known as "spongy regule" being the best, owing to its porous nature.

This material is not easy to calcine in any form of furnace, great care being necessary owing to its low fusing point; in fact, it is seldom calcined except where the so-called "direct process" is carried on, and from experience gained in calcining it for this process, the difficulties and great cost of such calcination were amply proved.

By using the converter process for this operation the same end is obtained as far as the subsequent refining is concerned, but the troubles in the calcining are largely overcome and a more suitable product obtained for charging into the refining furnaces, and, the material being in lump form, less loss from dusting results.

Against this, more slag is produced than is the case with the Nicholls and James process, but the elimination of the impurities is decidedly better than is obtained by treating "regule" by either the ordinary Welsh roasting process or the Nicholls and James process; this latter fact is of great importance where the better classes of copper are required, as, for instance, "Best Selected."

In treating this material the regule is crushed to 5-8 inch gauge and only wetted with water, no silica being required, as the product operated on is nearly free from iron and consists of practically pure copper sulphide, Cu_2S.

The iron pots used for this are much smaller than with either ore or regulus, and are mounted on trunnions in a carriage running on rails. These pots are conical, being 5 feet 3 inches at the top, 11 1-2 inches at the bottom, where the blast pipe enters, and 3 feet 6 1-2 inches deep; such pots will each hold about two tons of regule.

The method of working is to light a small fire on the false wrought-iron plate with which the pot is provided, and then put on some well-burnt pieces of product from a previous charge, broken up to about 3 to 4 inch gauge; these pieces consist (as will be seen later) of almost pure copper; when they have become a dull red and the fire has burnt low, the wet regule is tipped in from a tram until the pot is half to three-quarters full, a low blast being then turned on (about 6 ounces), and when the

charge has burnt through in several places the balance of the regule is added.

It does not matter how wet the regule is that is being treated; water has been seen running out of the bottom of the pot before now and yet the charge has burnt well; the chief difficulty is to get the men to keep the fire small enough in first charging; if too hot a fire is used the regule, which melts at a very low temperature, simply runs and blocks up the holes in the false bottom, so preventing the air from getting through.

These charges take about eight hours to burn, the blast pressure used being from 8 to 10 ounces only; when high pressures are employed the regule melts and so stops the process.

The final product obtained consists essentially of porous metallic copper mixed with oxide sulphate, and some unchanged regule, and for some time the main trouble was to break up the mass; this, however, was overcome by using a heavy iron ball weighing about 16 cwt., which was hoisted up by a steam winch 20 feet high and allowed to drop on the sintered regule product; a few blows generally served to divide it into several pieces, which could be further reduced if necessary by the use of a sledge hammer and gad.

It is only necessary to break up the pots of sintered regule small enough to enter the side doors of the refining furnace to which the product is sent.

The fines which are made in breaking up, as well as any small amount of unburned regule, are put into a travelling hopper, which runs over one of the ordinary roasters, and is there converted into pigs of rough copper; this roaster taps beds of copper every twelve hours.

This method of treating regule comes very much to the same thing as adopting the so-called direct process of Messrs. Nicholls and James, except that the troublesome calcining of white metal is done away with; the product is better to handle, being mostly metallic copper; it is not necessary to have the samples run down to see when the right amount of calcined material is present; there is less loss in flue dust both in the calcining and refining; the product being in lumps is easier to melt in the refining furnace, and the quality of the copper is better; on the other hand, more slag is produced than in the direct process.

Some experiments were conducted as to the elimination of impurities from regule, using, 1st, the ordinary Welsh roasting process; 2nd, the direct process of Messrs. Nicholls and James; and 3rd, the McMurtry-Rogers process, and in the case of nickel and bismuth the following are the results. Taking the ordinary Welsh process as one, the ratio of elimination is:—

	Nickel.	Bismuth.
Welsh process	1.0	1.0
Direct process	1.5	1.12
McMurtry-Rogers process	1.87	1.39

Higher results than here given were obtained for nickel, but this is considered a fair average.

Experiments were also undertaken to see if the gas given off from sintering could be used for the manufacture of sulphuric acid, but, like all processes using an air blast in a converter, the gas varies considerably in composition.

The following are some of the results obtained:—

	SO_2.	O.
Gas from ore	5.4	8.0
"	3.0	...
" regulus	5.5	12.0
" regule (mean)	11.1	5.6

An experiment was conducted with gas from the regule by blowing it with a fan into the first chamber of the acid works, but although acid was made it caused trouble in other ways by reacting on the Glover tower and ore burners, so had to be given up; but it is quite possible that this could be used for the manufacture of sulphuric acid, if required.

Reactions.—When calculating the heat of combustion of sulphur-bearing materials—taking into account the heats of combustion of the metals present and heat of formation of silicates formed (if any), as well as the heat furnished by the sulphur—we find that even a very silicious mixture contains a sufficient amount of available energy to keep the temperature of the mass above ignition point, provided that the combustion takes place with sufficient rapidity to neutralize the unavoidable loss of heat by radiation. As a proof of this statement it has been found possible at Wallaroo to burn material containing only about 5 per cent. of sulphur and 5 per cent. of iron, with no more than sufficient fuel to start the combustion.

In ordinary calcining processes when the percentage of sulphur is low and the ore is fine, heat must be supplied from an external source to make up for the radiation losses. If it is attempted to quicken the combustion of ore in sulphur by blowing air through it, a very large amount of dust is produced; but when the ore or crushed product is wetted the mixture can be desulphurized to any extent required in practice and with great rapidity; the water added plays a very important part in the process and cannot be dispensed with.

The mechanical effects of the water in holding the upper portions of the charge together, and so preventing dusting, is obvious. There are other effects caused by the water which are not so apparent. In the first place, the wet mixtures used conduct heat badly and so keep up the temperature at the seat of the combustion and cause this zone to move upwards as a fairly horizontal layer. The products of combustion also leave the surface of the charge from a large number of points distributed all over the surface.

(To be continued)

It is difficult to estimate the amount of potential power lost in the form of waste coke-oven gas. But it has been calculated that, assuming an oven is carbonizing at the rate of 7 tons a day, the waste gas from such an oven would be equal to about 40 horse-power in a gas engine.

Platinum metals have a very curious relation to mercury. So long as the sodium amalgam is rich in sodium they amalgamate perfectly, but as soon as the sodium is spent the platinum metals leave the amalgam and will not remain combined with it.

The hydraulic method of working auriferous gravels, with or without the "giant," delivers a stream of water and gravel to the upper end of a long set of sluice boxes which have riffle blocks along the bottom. As the water and gravel rush along, the heavy grains of gold, platinum, magnetite and other heavy minerals settle into the crevices or riffles between the blocks. The gravel, which has been deprived of most of its values and heavy grains, goes off the lower end of the sluices as tailings.

ONTARIO FELDSPAR

According to the Ontario Bureau of Mines' Report, recently issued, the production of feldspar is increasing. The output of the Richardson mine, owned by the Kingston Feldspar Company, is now about 130 tons per day. No. 1 pit at this mine, on the southwest side of the quarry, has a depth of 75 feet and an area of 250 feet by 50 feet. No. 2 pit, on the northeast side, has an area of 300 feet by 50 feet and an average depth of 50 feet. A shaft 30 feet deep has been sunk between No. 1 and No. 2 pits, and the water drains from the pits to the shaft, where a No. 10 Cameron pump raises it to the surface. The feldspar in No. 2 pit is dipping to the northwest under the body of quartz which appears on the surface.

The Jenkins mine, near the Richardson, has been closed for the last year.

At Border mine, in the Township of Portland, feldspar is being taken out of an open cut some 200 feet long, 20 feet wide and 25 to 30 feet deep. The dike of feldspar runs in a northeast by southwest direction, and cuts across the gneiss formation. Bodies of quartz are found in the dike.

The Kingston Mining & Development Company also work a mine in Portland Township. This open cut is 200 feet long by 25 feet wide and 8 feet deep. The feldspar occurs in a large pegmatite dike, and is the predominant mineral in that part of the dike being worked. The dike occurs cutting a dark gneiss.

EVALUATING COAL

In *The Colliery Guardian* (London, England), for April 12th, is a report of the monthly meeting of the Manchester Geological and Mining Society. During the meeting Mr. W. H. Coleman gave an exhibition of the new calorimetric bomb, and explained its use in ascertaining the value of coal. The bomb is made of steel, of such a thickness and shape that it will stand a pressure of more than 200 atmospheres. Before explaining how the bomb is worked, Mr. Coleman spoke on fuel valuation in general, treating the subject under three heads: (1) Sampling of the fuel, (2) determining its calorific value, and (3) comparing different fuels to find out which will serve the purpose in hand most economically.

As to the first point, the chief difficulty in the way of determining the calorific value of a fuel was the fact that it was not at all easy to obtain an average sample, and unless the sample was what it professed to be—unless its composition was the same as that of the whole bulk of the fuel under question—it was useless to waste time and money in making elaborate calorimetric determinations.

Mr. Coleman then pointed out the necessity of obtaining a large original sample of coal, under the everyday conditions of shipment. A cart load, after thorough mixing, should be quartered down to 100 pounds; great care being taken to preserve the right proportions of lump and fine. The sample was next crushed and again quartered to 2 pounds or 3 pounds. This quantity was then crushed to a moderately fine powder. The whole of these operations should be done as rapidly as possible.

Three ways offered themselves for determining the calorific value. First, an ultimate analysis of the coal might be made and its theoretical calorific value calculated. This, though accurate, took a considerable time, and required the services of an expert chemist. Second, the moisture, ash, volatile matter and fixed carbon might be estimated and the calorific value calculated from one of the numerous formulæ given by different authorities. This simple method, though useful in checking deliveries, the calorific value of which had been accurately determined before, was not sufficiently accurate to discriminate between several different qualities of coal.

In addition to the calorimetric determination, the length of flame, the quality of the ash and other factors must be taken into account; but, given several samples of coal, all of which are otherwise suitable for the intended use, the most economical coal can be selected by the calorimeter.

THE LEGEND OF THE FIRST PROMOTER

In ages prehistoric,
When legends allegoric
Were the only kind of substitute for papers,
The Son of Tubal-Cain,
In language crisp and plain,
Was instructed to abstain from silly capers.

For that sinful son of Tubal
Said: "I know that every Rube 'll
"Want to buy a share in Eden's only venture."
(He had found a chunk of gold
Where Euphrate's waters rolled,
And he straightway started in to merit censure).

'Twas to Adam first he went,
And the case he did present;
He recited how in fooling on the margin
Of the river he had seen
That yellow golden sheen;
And Adam said, "You're sure you're not enlargin'?"

So it ended up in this,
That Adam said: "I wis
"I'm up to buying shares in something good,
"But, grandson, by your leave,
"I'll consult with Mother Eve—
"She's sewing leaves together in the wood."

And the consequences were
(For the man persuaded her),
Poor Adam gave a mortgage on the Garden;
And the Son of Tubal-Cain
His only was the gain,
And the sons of men are working yet for pardon.

But Tubal-Cain himself,
He scorned the dirty pelf,
And he spoke in accents scathing to his son:
"Since this wicked world began
"I'm the first Straight Mining Man."
And he smote him for the thing that he had done.

And Tubal spake again—
Very shame did him constrain—
"To think that I have bred a d—d promoter;
"I'm a plain blunt mining man,
"And if I conceived a plan,
"I couldn't talk one-half enough to float her."

Now of schemes there were no more,
In those misty days of yore,
Till Noah and "Consolidated Ark";
But his venture paid because
All the water outside was—
And the Son of Tubal-Cain did not embark!!!

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA.

East Kootenay.

The recent cessation of work in the coal mines of the Crow's Nest Pass is causing much anxiety throughout the mining districts of Southern British Columbia particularly, and generally in the other parts of the Province which depend on the Canadian Pacific Railway for their transportation facilities. At the time of writing no arrangement, not even a temporary one, has been made for a resumption of work by the coal miners, pending investigation by the Board appointed under the Conciliation Act lately passed by the Federal Parliament. The following press despatch from Fernie, where the operators and miners are now discussing the points at issue, will serve to show the seriousness of the position so far as it affects the industries directly concerned:—

"The number of men affected by the strike directly, and in the other trades and industries dependent on the immediate supply of coal, is conservatively estimated by a prominent mining official here as 15,000 men; that is, smelters, supply men, miners and train crews.

"Dealing with the coal mining industry in the Pass alone, the following are the names of the mines affected, estimated number of men employed and the daily output of coal and coke:

"In British Columbia.—Crow's Nest Pass Coal Company's Coal Creek mine—850 men, 2,300 tons of coal and 300 tons of coke. Michel mine—450 men, 1,500 tons of coal, 250 tons of coke. Total—1,300 men, 4,800 tons coal, 550 tons coke.

"In Alberta.—International Coal & Coke Company's Coleman mine—400 men, 1,500 tons of coal and 250 tons of coke. Canadian-American Company's Frank mine—275 men, 600 tons of coal, no coke. Hillcrest mine—175 men, 450 tons of coal. West Canadian Collieries' Lille mine—300 men, 600 tons of coal and 30 tons of coke. Bellevue mine—175 men, 450 tons of coal. Total—475 men, 1,050 tons coal, 30 tons coke.

"Brekenridge & Lund Company, Dundbreck mine—75 men, 200 tons of coal.

"Galbraith mine—20 men, 50 tons of coal.

"Pacific Coal Company, Bankhead mine, anthracite coal—550 men, 1,200 tons of coal.

"McNeil Company, Canmore, anthracite coal—275 men, 500 tons of coal.

"Total—3,400 men affected, 9,000 tons of coal daily, and 1,100 tons of coke."

Rossland.

An advance of wages of 25 cents per day is to be given to shovelers, carmen, ore sorters and surfacemen employed in Rossland mines, as from May 1st, inst. This will bring the wages of men so engaged up to $3 per day, instead of $2.75, the rate heretofore paid in Rossland camp. Men similarly employed in Boundary district mines have long been paid at the rate of $3 per day. The companies agreeing to this advance are the Consolidated Mining & Smelting Company of Canada, owning the Centre Star War Eagle group of mines; Le Roi Mining Company, owning the Le Roi and Black Bear, and operating under bond the Spitzee mine; the Le Roi No. 2, owning the Josie and No. 1 mines; and the White Bear Mining Company, owning the mine of that name. The letter from the mine managers to the executive of the Rossland Miners' Union, acceding to the request for the advance abovementioned, also intimated that no other increases would be made. It stated that: "In view of the fact that the ores of Rossland camp are low grade, containing low copper values, and, therefore, affected only to a small extent by the increased price of that metal, making it difficult to carry on operations at a profit, it would be distinctly understood that in thus meeting the views of the men employed by the undersigned they have done the utmost possible to do, and that further requests for increased pay cannot be considered."

Similkameen.

The Daly Reduction Company has resumed operations at its 40-stamp mill at Hedley. As yet there is not sufficient water flowing to give power enough to run all the stamps, but as the season advances and the snow melts the number dropping will be increased until the mill shall be running at full capacity. In connection with the Nickel Plate mine, which supplies the mill with ore, the air compressor is working and both electric and gravity tramways that between them connect mine and mill are being operated. Those in charge of mine, mill, etc., are:—G. P. Jones, mine superintendent; E. A. Holbrook, general superintendent of lower works and cyanide plant, and A. Clare, in direct charge of stamp mill, vanners, etc.

It is announced that Chas. Camsell, of the Geological Survey Department of Canada, will spend the ensuing field work season in the Similkameen, continuing the geological work he was engaged in last year. The object of the work is a topographic and geologic survey for a sheet to embrace the whole of the Similkameen district.

Vancouver Island.

The Tyee Copper Company is now receiving more custom ore at its smelter at Ladysmith than at any previous time since it commenced smelting operations. For two or three years it has employed Mr. W. M. Brewer as its ore buyer, and he has paid particular attention to the gradually developing lode mining fields in Southern Yukon and Southeast Alaska. At length tangible results from his assiduous attention to that field are being obtained, in the shape of regular shipments of copper ore from mines on Prince of Wales Island and other northern mining camps. The Britannia Smelting Company is also receiving much ore from the Mount Andrew mine, Prince of Wales Island, in addition to its customary large shipments from the Britannia mine on Howe Sound, distant about 60 miles by water from the smelter at Crofton, V.I.

Coal mining continues active at the several collieries of the Wellington Colliery Company and the Western Fuel Company. The former is operating the Wellington (Extension) and Comox (Cumberland), Collieries, each with three or four mines, and the latter the No. 1 Shaft, Protection Island Shaft, and No. 4 Northfield mines, all in the neighborhood of Nanaimo. The coal measures in all three districts are extensive; those already explored are known to contain large reserves of coal, sufficient to supply for many years even a larger annual output than that of recent years. There is beside a considerable area of country known to be coal-bearing which has not yet been prospected. Preliminary figures of production in 1906 (the annual statistics have not yet been published by the Provincial Bureau of Mines, so are not available) showed: Western Fuel Company's mines, No. 1 Shaft and Protection Island, 290,000 tons; No. 4 Northfield—a newly opened mine—83,700 tons; total, 373,000 tons. Wellington Colliery Company's mines, Cumberland, 409,000 tons; Extension, 381,000; total, 790,000. Total gross output of Vancouver Island coal mines, 1,163,700 tons. Beside its coal sales, the Wellington Colliery Company sold last year between 17,000 and 18,000 tons of coke, made at its ovens at Union Bay, Comox district. The foregoing production figures are given with the object of conveying an adequate idea of the extent to which coal mining is carried on by Vancouver Island collieries. So great has been the demand for coal for several months that this year's output to date will probably be found to have been larger than for several years last past, if not greater than for the corresponding period of any previous year in the history of these coal mines.

General.

The Government of British Columbia has decided not to give its assent to any prosecutions under the Lord's Day Act, so the Attorney-General stated in the Provincial Legislature just before

it was prorogued on April 25th. It is understood that the members of the Eexecutive Council of the Province gave the matter their careful consideration and eventually came to the conclusion that conditions prevailing in British Columbia differ so much from those obtaining in Eastern Canada that in their judgment it would be best to take advantage of the optional power the Act gives Provincial Attorney-Generals to refuse assent to prosecutions under its other provisions. It will follow, therefore, that the interruption to carrying on the mining and smelting industries of this Province, as in the past, will not take place, as has been prematurely suggested it would. Incidentally it may be mentioned that some of the larger mines have for several years been in the habit of suspending all mining work on Sundays.

The hearing of the extra-lateral rights mining case of Star vs. White by the full court of British Columbia has been concluded, and judgment has been reserved. This cause, in which defendant is being sued for a large sum of money as compensation for ore taken from the claim of plaintiff, has been before the courts for about sixteen years. About two years ago the Chief Justice gave judgment in favor of defendant, but last year plaintiff secured an order from the full court directing that certain additional work be done, and W. E. Zwicky, manager of the Rambler-Cariboo mine, Slocan, was appointed by the court to supervise the doing of this work. Both sides called experts to pronounce upon the result of this work—for the plaintiff, Frank L. Sizer, of Helena, Montana, and S. S. Fowler, of Nelson, B.C.; for the defendant, Max Boehmer, of Denver, Colorado, and W. J. Elmendorf, of Spokane, Washington. The recent hearing occupied the attention of the full court for about a fortnight, and as the amount involved is $500,000, its judgment is awaited with more than ordinary interest. The mines concerned are adjoining properties in the vicinity of Sandon, Slocan.

The Provincial Legislature has passed an Act providing for an eight-hour day for smelter employees, as under:

"No person shall be employed in or about any smelter, sorting, handling, removing or smelting ores or matte in any stage of preparation for a longer period than eight hours in any twenty-four hours.

"Any owner, agent or manager, or anyone acting on their behalf, employing any workman or person in contravention of this Act, shall be liable to a penalty not exceeding one hundred dollars for each workman or person so employed, and any workman or person so working for a longer period than specified in section two of this Act shall be liable to a penalty not exceeding one hundred dollars nor less than twenty dollars.

"Twenty-four hours for the purposes of this Act, shall mean midnight to midnight.

"This Act shall come into force on the first day of March, 1908."

ONTARIO.

Algoma.

Very favorable reports are coming in with regard to the copper mining prospects of the Dean Lake neighborhood, which is now being extensively prospected and opened up, and which, from all accounts, appears to be one of the richest copper districts in Algoma.

A promising-looking property, known as the Allan Eckel Mine, has recently been opened up by some Toronto people, and a good showing of ore is reported, while several other good prospects have been located. The Jury Company are finding an exceedingly good showing, one portion of their vein at a depth of 20 feet carrying two feet of almost solid ore. Their property consists of 320 acres, and the vein which they are now working extends almost continuously for 1 1-2 miles, with a width of 8 to 16 feet.

The Northern Ontario Company are also going steadily ahead and are raising good grade ore. They are now employing about thirty men on their workings.

Mr. T. Hayes Sheen, general manager of the Copper Mining & Smelting Company, of Ontario, Limited, has now returned from England. He has obtained an option on the Bruce Mines & Algoma Railway, which it is intended will be extended from Rock Lake, 16 miles north of Bruce Mines, to join the C. P. R. main line, thus opening up a very rich mineral country. If this extension is carried through important developments may be looked for in the mining industry in Algoma.

Cobalt.

The resignation of the Hon. William Templeman from the presidency of the Airgiod Cobalt Mining Company lends color to the oft-repeated rumor that he is soon to accept an appointment as Minister of Mines in Premier Laurier's Cabinet. While Minister of the Interior he felt perfectly free to take an active interest in this important enterprise, and it is probable only because he feels that as the head of the Government's Mining Department he should have no connection with private mining enterprises that he retires from the position. While the corporation regrets the loss of Mr. Templeman's services, there is much satisfaction that Hon. L. Melvin Jones, of Toronto, has been willing to take the presidency in his place. The vacancy thus occurring on the Board has been filled by the choice of Hon. James Ross, formerly Commissioner to the Yukon, who becomes chairman of the Executive Committee.

Frequent reports are made of important finds at the mines lying at the foot of Cobalt Lake, and extending around to the west of the railroad. During the past week rich veins were found at the Trethewey and the Buffalo, and during one night over $6,000 worth of ore was taken from the most recently discovered vein at the Townsite, although the plant is as yet running at but one-half capacity. These mines are all in a direct line with the La Rose, Nipissing, McKinley-Darragh and other properties that rank as the most valuable in camp.

The possibilities for the development of these mines, as of all others in this district, are good, as has been shown frequently in the past. Among the many odd stories of the unexpectedly rapid increase in values is that O'Brien, whose name is borne by one the biggest mines in the camp, once offered his property in exchange for a carload of horses valued at $2,100. He has since been offered and has refused $6,000,000 for what he once thought was of so little value. It has also been figured out that $500 invested in Hudson Bay stock three years ago would now amount to $186,000, in addition to several thousands in dividends.

Work on the development of the Airgiod property is progressing rapidly, and Mr. Askwith, the engineer in charge, believes the plant will soon be in full operation. A complete outfit of machinery has recently been received, and is now being installed. In the meantime hand work has been pushed, and only last Saturday a discovery of smaltite very rich in silver was made in shaft No. 9.

Work has begun upon the development of the property of the Sutton Bay Silver Cobalt Mining Company, located at Sutton Bay. Lots No. 1 and No. 2 will be opened up at once under the supervision of Mr. Rupert Simpson, who was formerly in charge of the Townsite Mine.

Mr. A. T. Budd, who has just returned from a visit to Toronto and Ottawa, states that the Cobalt Native Silver Company has practically decided to begin active operations toward the development of its property in the second concession of Bucke Township, adjoining the Thompson and Annex claims. He thinks a small plant will be purchased and started on the 10 inch vein of galena.

Mr. Joseph Houston, chief engineer at the O'Brien Mine, is getting everything in shape to turn over to his successor, for he is soon to take charge of the Right of Way property, where a much larger plant is to be installed as soon as delivered.

Mr. William S. Mitchell reports a recent valuable discovery in one of his properties in James Township. This is on one of the discovery claims of the district, and is among the nest of claims

composed of the Munroe, Saville and others, which Mr. Mitchell has incorporated into the "Elk Lake Mines, Limited."

The Temiskaming Mining Company shipped a carload of ore last week which will undoubtedly be a record-breaker for richness. Their vein from which it was taken is one of the richest in the district, and was struck at the eighty-foot level, and has given great encouragement to those who expect their values to increase with depth.

Mr. M. T. Culbert, of the O'Brien, has returned from an extended trip through Mexico, where he has been examining and reporting on silver properties.

On Wednesday evening, May 1st, the first regular meeting of the local branch of the Canadian Mining Institute was held in the Prospect Hotel, Chairman Cole presiding. A paper, which was read before the Mining Institute in Toronto by Prof. Van Hise, of Wisconsin University, entitled "The Geology of the Cobalt District," was read. The animated discussion showed how interesting the geology of this district is to the mine managers, and many new points were brought out. Interest was given to the meeting by the presence of Prof. Brock and Capt. Tyrell, who gave interesting addresses. The next meeting will be held on the first Wednesday in June.

A magnificent new vein was discovered last week on the Buffalo property. This property, under the able mangaement of Mr. Jones, has developed into one of the big things of the camp.

Mr. R. W. Leonard, president of the Coniagas, accompanied by Mr. Peak, of the North American Cobalt Smelting & Refining Company, of Thorold, were in town for a few days last week.

The towns in the mining district are fast assuming city airs, and both Cobalt and Haileybury can boast of clubs.

The Cobalt Club has secured very comfortable quarters in the Exchange Building, where they have two flats, consisting of billiard room, reading room, smoking rooms and card rooms, all furnished with mission furniture and decorated in excellent taste. The club now boasts of a hundred members, and it is the intention to erect a building of their own, with dining room and all the conveniences of a city club. At the annual meeting, held on 27th April, the follwoing directors were elected:—F. H. Marsh, manager Imperial Bank of Canada, Cobalt; S. H. Logan, manager Canadian Bank of Commerce, Cobalt; C. B. Flynn, of the Colonial Mining Company; George Ross, barrister, Cobalt; J. McConnell, manager Green-Meehan Mine; manager of Government mines; J. Lorne McDougall, barrister, Cobalt. The new Board are all quite enthusiastic, and the future success of the club is assured.

The Haileybury Club is another organization which tends to afford some social advantages and comforts to the bachelors of Haileybury, and probably to a number of benedicts, at present homeless in their search for the white metal.

Kingston, Ont., is to be the site of the smelter of the Stanley Smelting Works. The Kingston Council has granted the company a free site of five acres. A four hundred ton concentrator and an aerial tramway are to be installed at the company's mine. For the smelter, Kingston, with its admirable harbor, should be an excellent site.

Eight inspectors will be sent by the Ontario Government to Cobalt and Temagami districts and the outlying country, to investigate claims and confirm or cancel discoveries.

The Ontario Department of Mines, recognizing the difficulty of carrying on development work under the severe conditions of this very protracted cold weather, has decided to exclude the period between April 15th and May 15th in computing the time within which work or mining operations are required to be performed by the Mines Act on any mining claims covered by working permits, in order to prevent forfeiture.

Nova Scotia.

Springhill.—A short description of Springhill may interest some at least of your readers. Springhill is essentially a mining town. A town of one industry—coal mining. It is a city set on a hill, several hills. It is a common saying that to leave the postoffice to go anywhere *in the flesh* you go uphill. The postoffice, the largest and most important public building, occupies a central position in the town. The building is of brick, and is rather a handsome structure. It is the hub, so to speak, of a wheel, formed of stores and other buildings, save toward the north, where the Cumberland Railway & Coal Company's reserve lands permit an uninterrupted view for miles towards Shepody Mountain range. The northern frontage of the town runs parallel to the crop of the working coal seams, following its various windings. This irregularity in the outcropping of the seams takes the form of an S in the three and a half miles of developed working. From the centre of this distance for probably a mile the line of strike is east and west, nearly. On the east it makes a gradual curve to the north, while the west side curves very decidedly to the south for a long distance. The town, in consequence of following the gyration of the outcrop, appears from a north view to be built in a semi-circle, the west end being suddenly rounded off to the south. There are no dwelling houses, therefore, built over the workings, or possible workings of these seams. To the north are the mines and their extensive and up-to-date surface plants, the railway, the various sidings and branches, and the railway buildings. To the east, south and west is the town, which owns the distinction of being the highest mining town in Nova Scotia, its elevation being 600 feet against the 216 feet credited to Westville, of Pictou County. In the matter of population, a few years ago Springhill was the most populous mining town in Nova Scotia. But Springhill to-day must give place to Greater Glace Bay, in Cape Breton, and possibly to Sydney Mines. The population of Springhill is in the vicinity of 7,000. There is one thing, however, I think Sprinkhill leads in. This is the workmen's ownership of land and houses. Of Springhill it can be said that for a town of but one industry there is none in the Province, possibly none in Canada that contains so many residences owned by workingmen. There are over 1,300 dwellings in the town. In ordinary mining towns a large proportion of the mining men are housed by the operating companies. On the tenant roll of the Cumberland Railway & Coal Company there are about 180 tenants. As the company has on its pay roll, at the present time, 1,700 names, it is at once apparent that the company has made no provision for housing a very large majority of its employees. There are, comparatively speaking, very few houses in Springhill built for the purpose of renting. So it is very evident that by far the largest number must be owned by the occupants, who are in the company's employ. In building, in recent years, the tendency is to get back from the works, the town extending east, south and west. The buildings are mostly of wood, the exceptions being the Postoffice, Town Hall and Academy of Music, which are of brick. The Technical and High School Building to be constructed this year will also be of brick. Springhill is a very healthy place as a rule; but is subject to epidemics, as a recent experience has shown. The town has a magnificent water supply, of the very best quality, brought in by gravity from a lake distant some seven miles to the south of the town, on the notrhern shed of Maccan Mountain range. The cost to the town was approximately $180,000, but this was money well expended. With the splendid water supply, however, we have no sewer system. To this fact are attributed the frequent outbreaks of typhoid fever and various ills. Especially is the north side of the town affected, the fall of the ground being towards the north. The open drains, with their accumulated impurities, make ideal breeding places for all sorts of disease germs. This condition will soon, however, be changed. The city fathers are getting busy over the question of sewerage, and decided improvement is looked for this year. There is one other thing this town can boast of, and that is good roads. It was not always so, but with the discovery of red stone as a macadam, an era of decent streets began, and for years past we have enjoyed the driest and cleanest streets of any town in the Province. It may not be out of place to remark that this red stone is a product of the mine. Rock

and fire clay from tunnels and roof strippings, slate, shale, splint, coal and wood refuse are sent up out of the mine, dumped in a huge heap, and this accumulates for years. It ignites through spontaneous combustion. It smoulders and burns until anything of a combustible nature is burnt out. There remains but a diminished heap of hard rubble, bright red in color, with not a particle of anything in it that makes for mud. This material, when spread a foot deep on the worst road, will stand years of the heaviest hauling without serious rutting. When placed on foot paths it will attain the smoothness and solidity of cement without the clothes-destroying dust that rises from the cement sidewalk. Although the red stone does not "make" in sufficient quantities for an extensive export trade, some hundreds of tons have been purchased by our progressive shire town of Amherst for street macadam. Springhill is somewhat noted in other ways. According to the population, it has more churches and other religious institutions, more societies, more clubs, more children, more schools, more *strikes* (to its credit or otherwise) than any mining town in Canada.

I will later give a description of the surface plant and collieries that may be of some interest.

GENERAL MINING NEWS

British Columbia.

The British Columbia Copper Company, operating at Greenwood, will presently install a cyanide plant of 500 tons per day capacity at the Napoleon Mine, Pierre Lake district, Washington. The Napoleon claims are two miles from Boyd's Station, on the Great Northern.

What is probably the first carload of coke ever imported into Canada from New Zealand will soon arrive in Vancouver on the steamer Pardo.

In the Lillooet district, B.C., the Alexandra Hydraulic Company are prosecuting work vigorously on Alexandra Creek, a tributary of Bridge River. The company has endeavored to induce the Government to construct a bridge across the Bridge River at Jack's Point.

On Sunday, April 21st, the Dominion Copper Company's Boundary Falls smelting plant was blown out. This was directly a consequence of the coal miners' strike.

Under the regulations governing the disposal of Dominion lands within the railway belt in the Province of British Columbia, coal lands may be purchased at $10 per acre for soft coal and $20 per acre for anthracite. Not more than 320 acres may be acquired by any one individuel or company. Royalty at the rate of 10 cents per ton of 2,000 pounds is collected on the gross output.

The Sudbury group of mines, not far from the Mother Lode and Sunset groups, in Deadwood camp, is being taken up by James Schiene, of Spokane.

The Ellemar copper mine, in Prince William Sound, in Southwest Alaska, has been sold to H. C. Elliott for $1,000,000. Mr. Elliott is president of the Hubbard-Elloitt Copper Mines Development Company. The mine was one of the first locations made in Southwest Alaska.

In the last week of April the erecting engineer of the Jenckes Machine Company and the Canadian Rand Company, turned over the new plant recently installed in the Idaho property to the Dominion Copper Company. The plant has since been operating smoothly. The compressor furnishes air for the Brooklyn, Idaho, Rawhide and Stemwinder mines, and operates two diamond drills and three pumps. It is a Rand type, and was manufactured in Sherbrooke, P.Q. It has a rated capacity of 25 drills, and is driven by a 450 horse-power Canadian Westinghouse electric motor. The current is taken from the South Kootenay Power Company's high tension hydro-electric lines, being brought from Bonnington Falls, on the Kootenay River, some 75 miles distant. To furnish the Rawhide with compressed air, a six inch pipe line was laid for more than a mile.

To illustrate the effect of the car and fuel shortage and the severe weather conditions of last winter, a comparison of the output of refined copper from the ore of Boundary mines, during the first quarter of 1906 and of the same period in 1907, may be made. For the first three months of 1906 the quantity was 7,500,000; for the first quarter of 1907 it was 5,000,000.

The Rambler Mine, in the new working between levels 7 and 9, is developing a vein of rich ore. A series of new stopes on each side of the 1,350 foot shaft is being started. New bunk-houses are being built and hoisting machinery installed.

Ontario.

On the Big Ben mine property, Bucke Township, four new buildings, to accommodate 40 men, are now completed. An 80 horse-power boiler, a compressor and a steam hoist are to be installed.

The unsurveyed territory immediately south of Lorraine Township is reported by prospectors to be, at least, promising. The formation is principally conglomerate and conglomerate slate. It is said that gold, silver copper, galena and cobalt bloom have been found there.

Pulp Mill No. 1 of the Sault Ste. Marie Pulp & Paper Company was almost entirely destroyed by fire on April 24th. Overheated bearings are supposed to have been the cause. Two hundred men are out of employment. The loss is heavy, though partially covered by insurance, and it will likely require eight months to rebuild.

The Ontario Government has refused to grant liquor licenses except in towns and cities within 20 miles of the Transcontinental Railway.

The Laurentian Mine Company has advanced the pay of its drillmen to $3.25 per day; helpers, $2.90; carmen, $2.75.

Sixteen miles north of Bruce Mines, in Morin Township, a discovery of cobalt bloom is reported.

Ontario—Cobalt.

The Badger mine property, consisting of 80 acres, staked out by students of the University of Wisconsin, has been bought by an English syndicate. The purchase price is said to be about $1,000,000.

Kerr Lake is to be partially drained by the Kerr Lake Mining Company, with the object of exposing a considerable amount of the lake bottom for prospecting. The Silver Leaf Mining Company has granted permission to the Kerr Lake people to use part of their property as a building site.

The directors of the Coniagas mines have declared a dividend of 2 per cent., and notify shareholders that the intention is to declare 2 per cent. every two months hereafter. This is at the rate of 12 per cent. per annum, and on the $4,000,000 stock will take $480,000.

Nova Scotia.

The iron ore deposits of the Eskasoni and McPhee Mountains have been bought by an English company. The surface indications are good and an excellent harbor will afford shipping facilities.

A ten-stamp gold mill is to be erected at Middle River, Cape Breton.

At Dominion No. 2 Colliery, the explosive Alexite is being experimented with exhaustively.

The site has been selected for the new Sydney Rolling Mills. The property comprises 28 acres.

The new Bessemer converter was blown in at Sydney on May 1st.

It is stated that the Gowrie & Blockhouse Collieries Company has been absorbed by the North Atlantic Collieries Company, Limited. The capacity of the pit at Port Morien is 400 tons per day. This capacity is to be increased to 1,500 tons per day. One hundred and fifty thousand dollars is set aside to effect improvements. At Long Beach, a mile distant, another shaft will be sunk, and the shipping pier will be largely improved. Several

boats are to be chartered. The company controls about 36 leases, on which six seams of gold are known.

The Nova Scotia Steel & Coal Company are about to close a deal whereby they will acquire large deposits of iron ore in the interior of Brazil. Mr. Harvey Graham is conducting the final negotiations.

Ten stamps will soon be added to the five already in operation at the Beaver Hot gold mine. Mr. S. Clifford MacLean is the resident engineer.

The amount of coal shipped by the Dominion Coal Company from Louisburg during the past four months was 450,766 tons. About 335,000 tons of this amount was shipped to Boston and Portland, while the balance was distributed between Maritime and Gulf ports and Newfoundland.

A rich find of gold-bearing quarts has been made at Montague, near Halifax. It is supposed to be a continuation of the old Rose lead.

Belief is growing in the probable consummation of a merger of the Dominion Iron & Steel and the Dominion Coal Companies.

At a special meeting of the Pioneer Lodge of the Provincial Workmen's Association at Springhill, N.S., it was decided almost without a dissentient vote to refer the "Stone Trouble" with the Cumberland Railway & Coal Company, to a Board of Conciliation for investigation.

ALBERTA.

A seam of coal six feet in thickness has been uncovered near Strathcona.

Coal has been discovered within the city limits of Calgary.

ALASKA.

About the middle of April a general lockout and strike was reported at the Treadwell mines. The trouble is attributed to the poor diet provided for the workingmen.

BOOK REVIEWS

THE MINING MANUAL FOR 1907, by Walter R. Skinner, London, 11-12 Clements Lane, Lombard street, E.C. Twenty-first year of publication.

The information set forth in the Mining Manual is classified into three sections—Australia, African, and Miscellaneous, covering 1,135 pages. The pressent issue contains particulars of 3,054 companies, of which 410 are Australia, 1,033 African, and 1,611 miscellaneous. As in previous issues, alphabetical lists of mining directors and secretaries and a dictionary of mining terms are included. These are supplemented by a list of engineers and mine managers, giving the names of the companies with which they are connected. A remarkable amount of information is condensed within the Mining Manual. Its practical utility is at once evident from the mere mention of what a field it covers.

FIRE ASSAYING, by Evans W. Baskett, B.S., D. Van Nostrand Company, 23 Murray street, N.Y., pages 105, price $1.25. This is a most useful outline of fire assaying. The illustrations are numerous and well chosen. Particularly valuable are the chapters on "Reagents and Fluxes" and on "Laboratory Tests." Being written with the avowed object of clearly presenting the subject to persons of no technical education, it is simple, lucid and direct in diction and manner. The book should prove useful to those who wish to acquire rapidly a working knowledge of fire assaying.

PERSONAL

Mr. J. Dix Fraser has returned to New Glasgow, after an extended visit to England.

Mr. A. G. Burrows is among the newly appointed Ontario Mines Inspectors.

We regret to learn that Superintendent S. D. Madden, who has been in charge of the diamond drill work on Little Nipissing, is temporarily incapacitated owing to an accident. We wish Mr. Madden a speedy recovery.

Dr. A. E. Barlow was in Toronto on mining business on the 5th and 6th of May. He then left for Cobalt.

The Hon. Frank Cochrane, Minister of Mines for Ontario, has returned from a long visit to the Old Country, restored in health.

Mr. Nicholas Flynn has been appointed general manager for the La Rose Mines Company at Cobalt.

Mr. A. P. Low, Director of the Geological Survey, has returned to Ottawa from spending a few weeks in the South. We are glad to learn that his health is completely restored.

Mr. J. C. Haas, of Spokane, Wash, well known as one of the pioneer engineers of the Boundary district, where he has still large interests, recently visited the Cobalt district to report on properties for a syndicate.

The Dominion Coal Company is being sued by Mr. Austin King, formerly superintendent, for $85,000 for wrongful dismissal.

Mr. Frank Robbins has been engaged to report on placer deposits on the Colorado River.

Mr. R. R. Hedley has been commissioned by the Federal Government to report on the smelters and reduction works of British Columbia in connection with the work of the recently created Department of Mines. The appointment is an excellent one, and the authorities are to be congratulated upon securing the services of so well known a metallurgical expert to undertake the duty.

Mr. Thos. Kiddie, formerly manager of the Tyee Copper Company's smelter at Ladysmith, B.C., has assumed the management of the Alaska Mining & Smelting Company's smelter at Hadley, Prince of Wales Island, where it is proposed to install the Kiddie hot blast system.

STATISTICS AND RETURNS

The following figures give the ore shipments of three districts of British Columbia for the week ending April 27th, and for the year to date:—

Boundry shipments—

Mine.	Week.	Year.
Granby	19,836	178,060
Mother Lode	6,808	53,649
Brooklyn	1,440	23,643
Snowshoe	2,699	20,756
Rawhide	1,760	19,481
Sunset	736	8,004
Emma	303	3,021
Mountain Rose	140	1,803
B.C.	12	1,358
Oro Denoro	814	990
Idaho	384	896
Providence	74	467
Morrison	150	469
Strathmore	31	53
Duncan	21	21
Other mines	...	327
Total	35,208	313,000

Kootenay-Slocan shipments—

Mine.	Week.	Year.
Sullivan	600	9,600
La Plata	46	1,177
La Plata, milled	425	6,800
St Eugene	354	4,321
Queen milled	185	2,960
Second Relief, milled	145	2,330
Hunter V	107	1,546
Silver King	645	691
Queen Victoria	80	352
Last Chance	22	274
Sunset	31	74
Idaho	26	48
American Boy	18	18
Other mines	...	5,711
Total	2,684	35,902

The total shipments from the mines in the above districts for the past week were 43,375 tons, and for the year to date 326,143 tons.

Rossland shipments—

Mine.	Week.	Year.
Le Roi	2,974	40,211
Centre Star	1,414	25,288
Le Roi No. 2	386	6,645
White Bear	149	577
White Bear, milled	500	2,200
Other mines	...	2,320
Total	5,423	77,241

Cobalt shipments, week ending May 4th, 1907:—

April 30th—O'Brien Mine, to American Smelting & Refining Company, Perth Amboy, N.J., 64,640 lbs.

May 4th—O'Brien Mine, to American Smelting & Refining Company, Perth Amboy, N.J., 65,750 lbs.

May 3rd—Townsite Mine, Canadian Copper Company, Copper Cliff, Ont., 40,070 lbs.

May 3rd—Silver Queen Mine, Canadian Copper Company, Copper Cliff, Ont., 44,000 lbs.

May 4th—Coniagas Mine, American Smelting & Refining Company, Perth Amboy, N.J., 62,000 lbs.

Total, 276,460 lbs.

CANADA'S IRON PRODUCTION.

The pig-iron production of the Dominion is keeping pace with the growth of other industries. In thirteen years the increase has been about 1,200 per cent., an average of nearly 100 per cent. per year. In 1894 the output was 44,791 tons, and in 1906, 541,957 tons. The production of last year was double that of 1904, when the output was only 270,942 tons. The output per year since 1894 up to last year is given in the following table:—

1894	44,791
1895	37,829
1896	60,030
1897	53,796
1898	68,755
1899	94,077
1900	86,090
1901	244,976
1902	319,557
1903	265,418
1904	270,942
1905	468,003
1906	541,957

Last year there were thirteen blast furnaces in operation, and in 1905 there was thirteen during the first half of the year and twelve during the latter half. The outlook this year isexceptionally bright, and when the immense iron ore discoveries around Port Arthur are developed an ouput of at least half as much again as that of 1906 may be looked forward to.

The following figures give the approximate output and shipments of the Dominion Coal Company for the month of April:—

No. 1 colliery	35,925
No. 2 colliery	54,379
No. 3 colliery	33,360
No. 4 colliery	49,434
No. 5 colliery	72,858
No. 6 colliery	16,708
No. 8 colliery	20,038
No. 9 colliery	33,208
Total output	315,911
Total shipments	212,772

CATALOGUES AND OTHER PUBLICATIONS

The rapid advance of the B. F. Sturtevant Company, Boston, Mass., in the electrical field has been noticeable and is particularly marked at this time by the issue of their Bulletin No. 63, showing various types and sizes of generating sets. These range from 3 to 100 kw. in output, the smallest size being driven by a 3 1-2 x 3 vertical engine, and the largest by a 14 x 14 horizontal centre-crank engine. A separate series, ranging from 7 1-2 to 100 kw., is equipped with vertical compound engines. All the types of Sturtevant engines illustrated are completely enclosed and arranged with watershed partitions to prevent the water from the piston rod stuffing box reaching the interior of the frame. All interior bearings are supplied with oil under a system of forced lubrication, thereby securing a mechanical efficiency considerably in excess of 90 per cent. Many of these generating sets in the vertical, simple and compound types have been designed to meet the rigid specifications of the United States Navy Department, and their successful passage through the inspector's hands appears to be the best evidence of the standard which is being maintained by the B. F. Sturtevant Company.

Bulletin No. 12, from Mussens Limited, Montreal, illustrates their double cylinder, single drum mine hoists and cages.

A revised price list of sprocket wheels has been received from the Link-Belt Company, of Chicago.

Two very attractive catalogues have been received from the Robb Engineering Company, Limited, of Amherst, N.S. One, on "Steam Boilers," traces the evolution of the Robb-Mumford boiler. The Mumford boiler was designed by Mr. J. A. Mumford in 1885, primarily as a portable boiler for saw-mills, mining purposes, etc., when a light, compact boiler was required with internal fire box. With its large, round furnace it proved a great success. In 1889 an outer casing of iron was added and other improvements made with a view to securing the utmost possible economy of fuel. The present type was designed by Mr. Mumford in 1896. Improvements embodied in it provided for position circulation, larger margin of water line, prevention of scale formation, and facilitated the removal of scale and sediment. Further improvements were made in 1902. In construction the Robb-Mumford boiler is especially adapted for carrying high pressures of steam with safety. Another catalogue describes the design and method of manufacture of the now celebrated Robb-Armstrong engine, of which many types are made for every variety of duty.

"Merralls' Mills" is the title of a descriptive catalogue which comes from the Merralls Machinery Company, 1123 Broadway, corner 25th street, New York. The Merralls people manufacture an especially substantial stamp-mill with certain features which recommend it to all practical men. One of these features is the individual mortar. Each stamp also has its own ore feeder and water supply. Screens on all four sides of the mortars afford quadruple discharge and effectually prevent sliming. Each stamp may be hung up for cleaning, repairs, etc., without in the least interfering with any other stamp. A great increase of amalgamating capacity is claimed as compared with the five-stamp open mortar. The individual mortar tends to prevent flouring of the mercury. A short, fast drop of a much heavier stamp gives the Merralls' stamp mill a very large crushing capacity. Sectional mills are made, by this firm, that are easily transportable.

EXCHANGES.

The Coal Trade Journal for May 1st predicts a record-breaking year in anthracite output.

A history of British Columbia placers, past and present, is started in the May 4th number of the Mining World.

Many good papers, among them "Stoping Systems at Broken Hill," appear in Mines and Minerals for May.

"Preservation of Mine Timber from Decay" is the title of a leading article in The Engineering and Mining Journal, May 4th.

The February number of the British Columbia Mining Record is on our desk. A very readable paper on the British Columbia Copper Company's Greenwood smelter is contained in this number.

Mining and Scientific Press, April 27th, has an excellent description of "The Geology of the Meta Madre," written by the editor, Mr. T. A. Rickard. In this number the announcement is made that the Mining and Scientific Press has once again taken up headquarters in San Francisco.

The Colliery Guardian, April 19th, has been received.

The Mining Investor for April 29th has been received.

The Chemical Engineer, April 1907, contains an exhaustive summary of recent literature on asphalt.

Canadian Machinery for May has been received. Robert W. Angus writes on "Some Features of Large Gas Engines."

The Mining Reporter, April 25th, administer a mild reproof to the daily press of mining camps.

The Industrial Advocate, April, gives a full and well-connnected report of the proceedings of the Nova Scotia Mining Society.

The Engineering and Mining Journal, April 27th, presents a copiously illustrated description of some of the leading Cobalt mines.

No. 3, Vol. XXV., of the Proceedings of the South Wales Institute of Engineers. The technical papers given in this issue are of a very high order.

"Quebec Mining Law," issued by the Department of Colonization, Mines and Fisheries, Quebec, in the form of a neat, compact booklet, has been received.

A valuable paper entitled "The Blast Furnace Practically and Theoretically Considered" is given in Iron and Coal Trades Review, April 19th.

Among other articles of interest, one on the "Black Sands of New Zealand, the Pacific and Tierra del Frigo," appears in the London Mining Journal, April 20th.

The earthquake anniversary number of the San Francisco Mining and Scientific Press (April 20th), in an incisive and cogent article, deals with the "Requirements of Modern Mining."

The Engineering Magazine for May has its usual number of first-class technical articles. "The Technical Student and the Engineering Apprenticeships Course" is worthy of careful perusal.

Compressed Air for April contains an account of a novel use of that substance. An ingenious New Yorker has discovered that compressed air can be used to good effect in quelling a storm at sea.

In the Mining World, April 27th, R. T. Hill writes on the "Geology of Sierra Amoloya, Mexico." A mine correspondent writes appreciatingly of Dr. David T. Day's work on the "Black Sands of the Pacific States."

COMPANY NOTES

In order to keep pace with the requirements of their increase in business, the John McDougall Caledonian Iron Works Company, Limited, of Montreal, have opened sales offices at the following places:—Montreal, 82 Sovereign Bank Building; Toronto, 810 Traders Bank Building; Winnipeg, 251 Notre Dame street; Vancouver, 416 Seymour street; Nelson, Josephine street; New Glasgow, N.S., Telephone Building.

Their principal products are waterworks equipment and all kinds of hydraulic and mill machinery.

The following new directors have been added to the Board of the Foster mine:—Mr. E. F. B. Johnston, K.C., Mr. Jos. Oliver, Mr. John Gowans Kent, and Mr. G. H. Doran.

The Ontario Gazette for the week ending May 4th contains the following list of new mining companies incorporated:—

The Ottawa Mica Mining Company, Limited, capital $350,000, head office Ottawa.

The Larder Lake Gold Hill Mines, Limited, capital $1,000,000, head office Toronto.

Imperial Consolidated Mining Company, Limited, capital $1,500,000, head office Toronto.

The Gilbert Consolidated Mining Company, Limited, capital $2,000,000, head office Toronto.

The Temagami Copper Company, Limited, capital $2,000,000, head office Toronto.

King Solomon Larder Lake Gold Mining Company, Limited, capital $1,000,000, head office Toronto.

Monitor Cobalt Prospecting & Developing Company, Limited, capital $500,000, head office Toronto.

Smaltite Silver Mining Company, Limited, capital $1,000,000, head office Toronto.

British Columbia.

Mounts Sicker and Brenton Olives, Limited. The annual general meeting was held in Victoria on April 16th. The financial statement submitted showed disbursements of $9,491.

METAL, ORE AND MINERAL MARKET

Aluminium, for No. 1 ingots—49 to 51 cents per lb.
Antimony—20 to 23 1-2 cents per lb.
Arsenic, white—7 1-4 to 7 1-2 cents per lb.
Barytes, crude—$11.25 to $14.50 per ton.
Bismuth—$1.40 to $1.50 per lb.
Cadmium—$1.40 to $1.46 per lb.
Carbons, for drills—$75.00 to $85.00 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, pure metal—80 cents per lb.
Cobalt, fo.b., Cobalt, Ont., unrefined—40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar—$7.00 to $15.00 per short ton.
Flourspar, lump—$8.00 to $10.00 per long ton.
Graphite, domestic—$45.00 to $150 per short ton.
Gypsum, lump—$4 per long ton.
Infusorial earth, ground—$15 to $35 per long ton.
Lead—6 cents per lb.
Manganese, pure—75 cents per lb.
Mica, groud—$65.00 to $85.00 per short ton.
Mica, scrap—$13 to $15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 95 per cent. pure—21 cents per lb.
Nickel—45 to 50 cents per lb.
Platinum, ordinary metal—$32 per ounce.
Pyrite, 38 per cent to 45 per cent sulphur—11 to 11 1-2 cents per unit.
Quicksilver—$41 per flask of 75 lbs.
Talc—$15 to $20 per short ton.
Tungsten, pure metal—$1.35 per lb.
Tungsten ore, 60 per cent. pure—$400 per ton.
Tin—42 3-4 cents per lb.
Zinc sheets—$8.60 per 100 lbs.

MARKET NOTES.

American iron and steel market is firm. Pittsburg bessemer stands at about $23 per ton.

Copper is quiet, with an improving demand. Lake copper, 25 to 25 1-2 cents per lb.; electrolytic, 24 1-4 to 24 1-2 cents per lb. The London market is displaying an upward movement; standard, £106 15s. per long ton.

Tin.—New York, 42 3-4 cents per lb.; London, £195 10s. per long ton.

Lead.—New York, 6 cents per lb.; London, £20 6s. per long ton.

Silver.—New York, 65 1-4 cents per ounce; London, a fractional advance to 30 7-16d. Mexican dollars, 50 1-4 cents.

Spelter.—New York, 6.52 1-2 cents per lb.; London, £25 17s. 6d. per long ton.

The first reference to the occurrence of silver in Canada is found in a paper by General Baddeley, R.E., read before the Literary and Historical Society, Quebec, 1830, where the deposit of galena at Bay St. Paul is alluded to. The percentage of silver is not stated, but the quantity of galena was thought to be insufficient for successful working.

The argument formerly advanced against the use of forced draft instead of induced draft that it burns out the grates, seriously injures the boilers, and blows gas and smoke from the fire doors, is now seldom heard. The basis of this opinion originated in the experience of some engineers with plants equipped with fans operated at far above the proper speed. This was the result of installing (through ignorance), a fan too small for the work, and then forcing it above its normal speed in order to secure the desired air volume. As a consequence, instead of creating an ash pit pressure of 3-4 to 1 1-4 inches, which is all that is ordinarily required, the pressure was forced up to even 5 or 10 inches, with the attending objectionable results.

In one instance, the engineer complained of gas discharged from the fire doors with incidental effects, and condemned forced draft in toto, although he was favorably disposed toward induced mechanical draft. Investigation showed that the fan was being operated at about 12 inches water pressure, which at once accounted for all the trouble.

When forced draft is used, the air as it passes from the ash pits to the combustion chamber is greatly reduced in pressure, owing to the resistances of the grates and the fuel. Coincidently, the stack, even if a short one, tends to produce a partial vacuum in the furnace. As a result it is practically impossible to create under proper conditions more than a slight excess of pressure in the combustion chamber, and this should not be enough to force the gases out at the fire doors.

Accurate knowledge regarding the proper application of the fan blower for this purpose will readily dissipate any false impressions regarding forced draft.

GREENING WIRE ROPE

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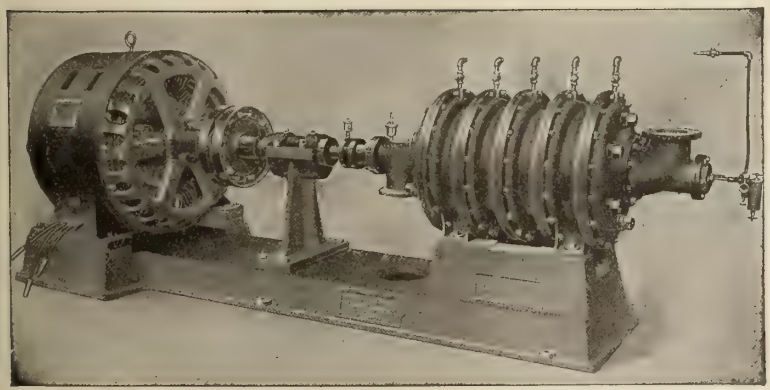
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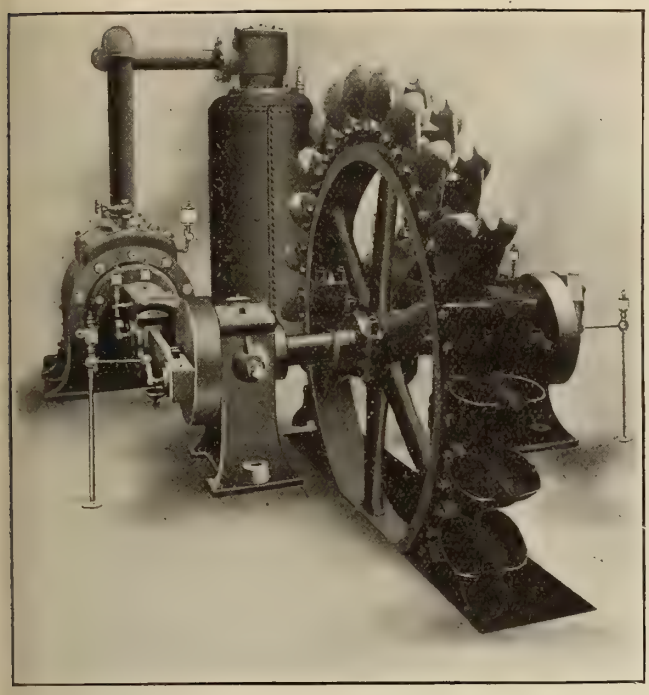
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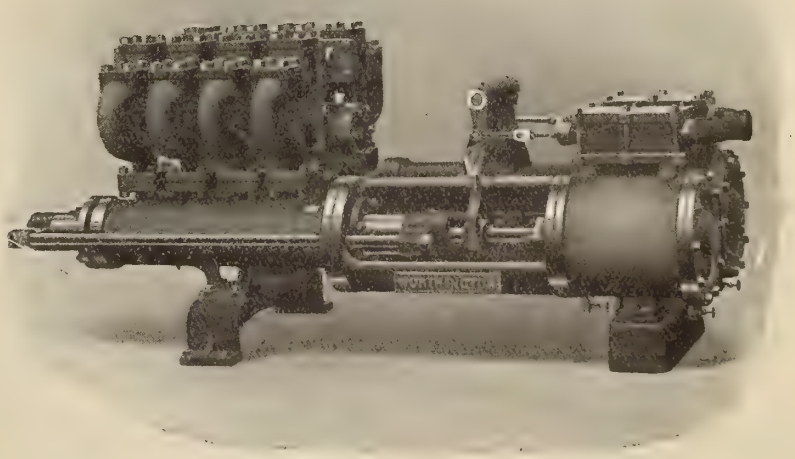
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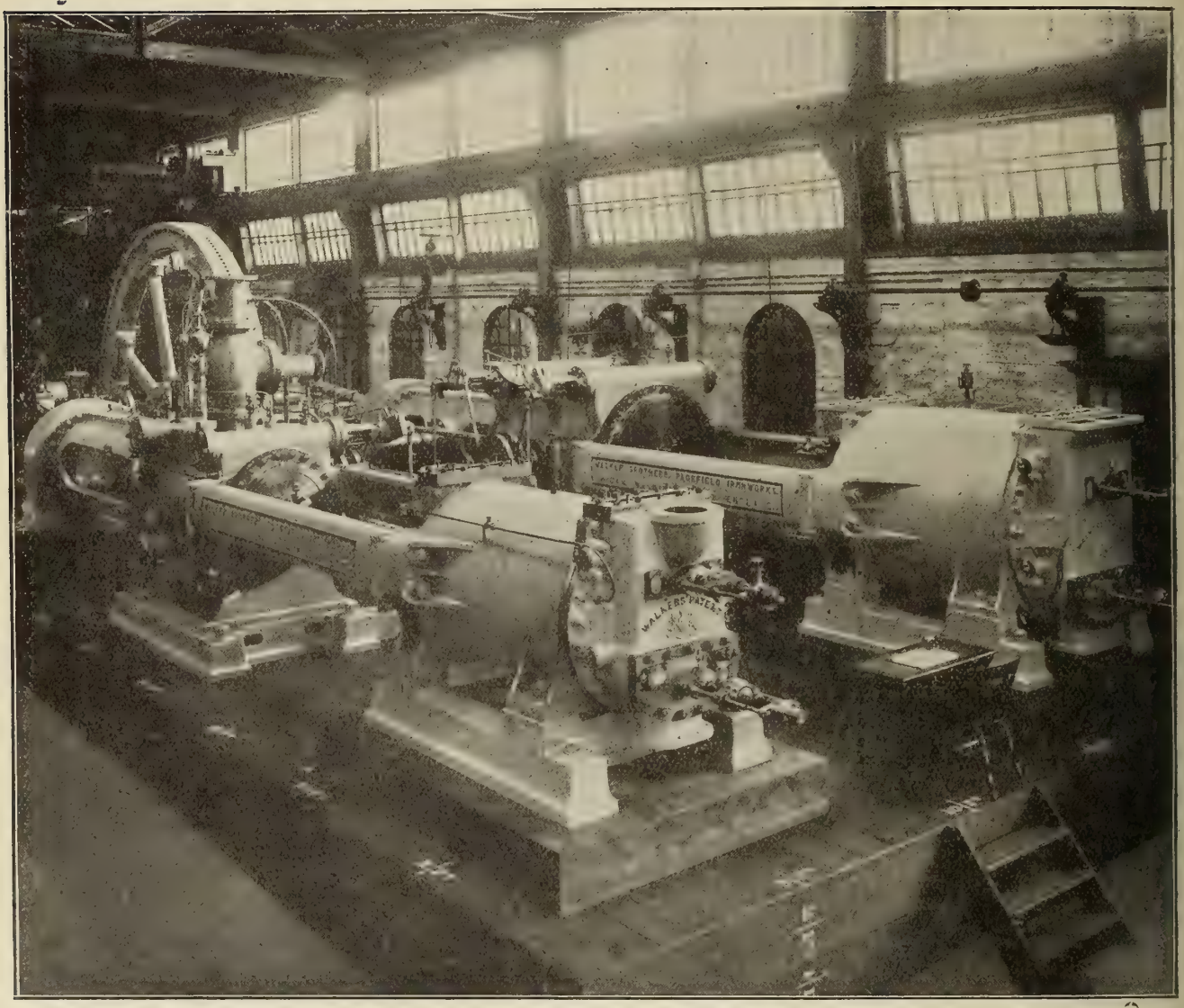
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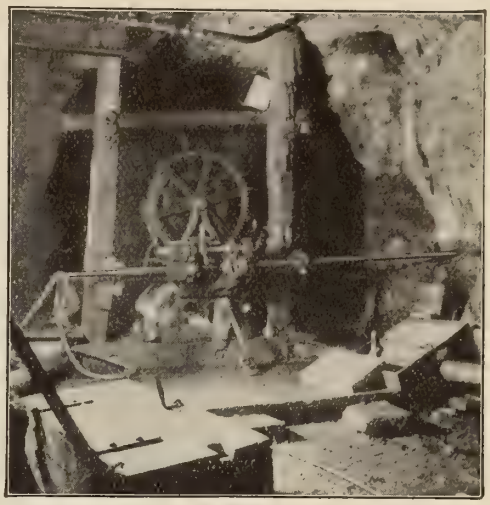
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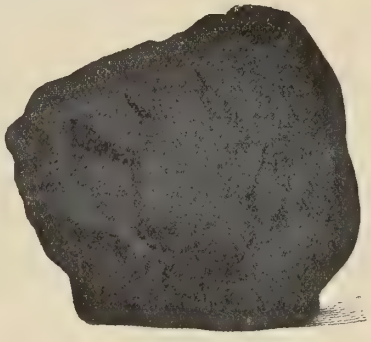


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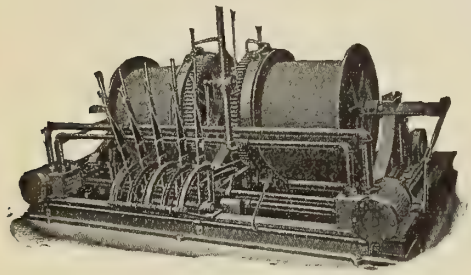
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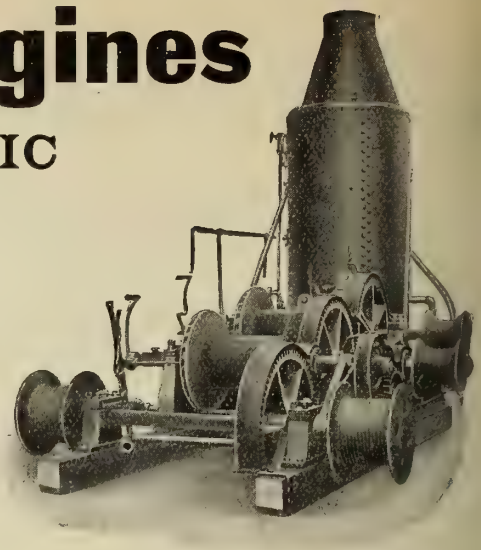
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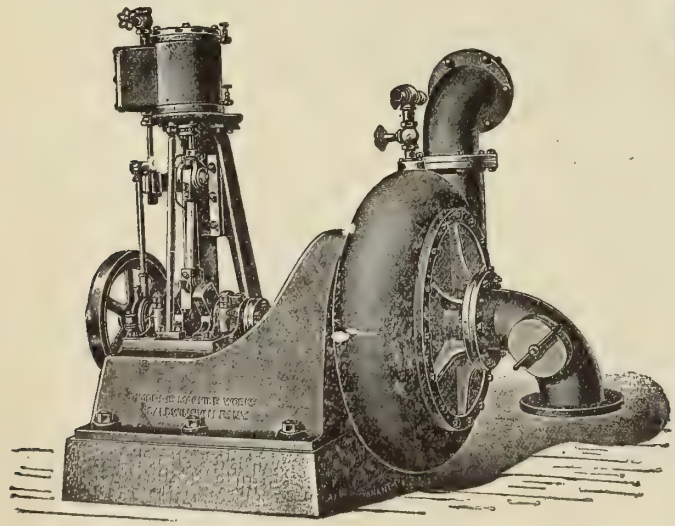
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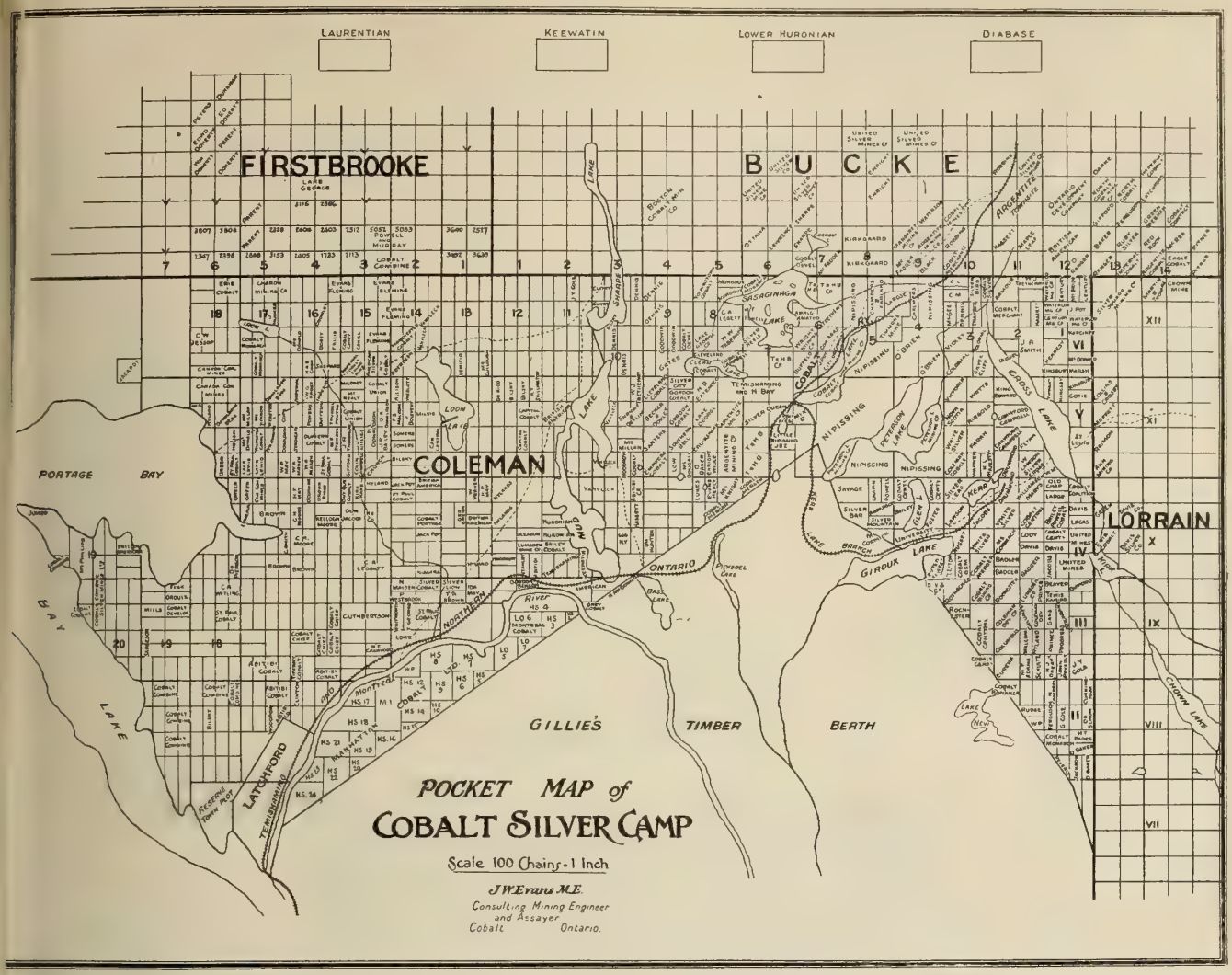
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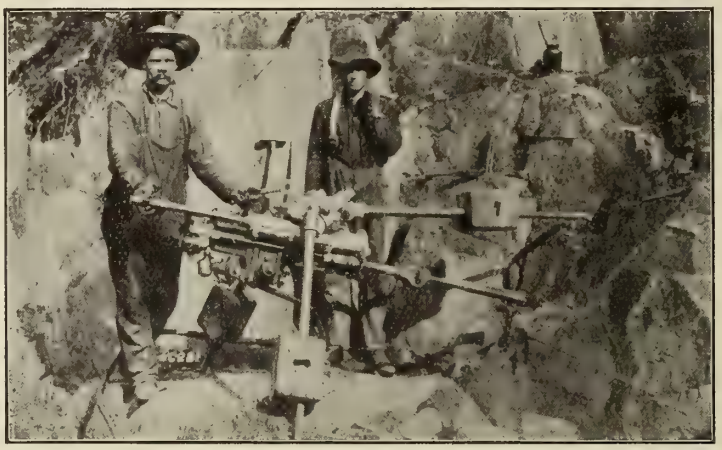
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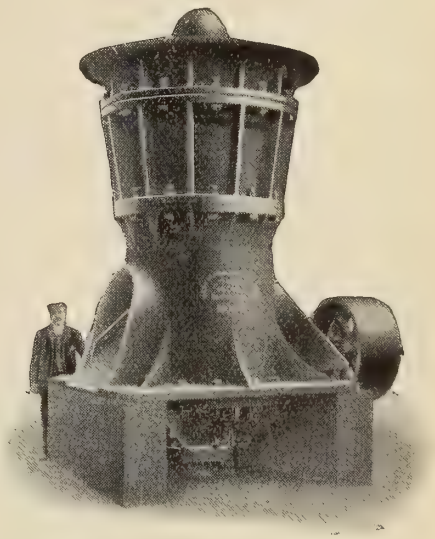
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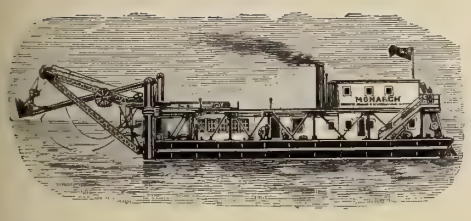
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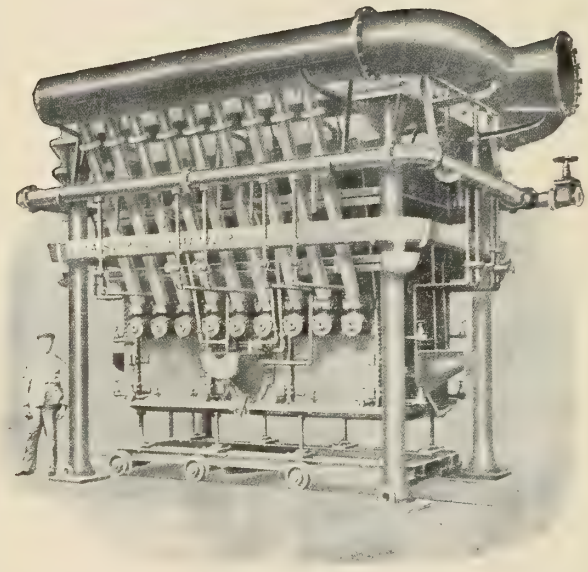
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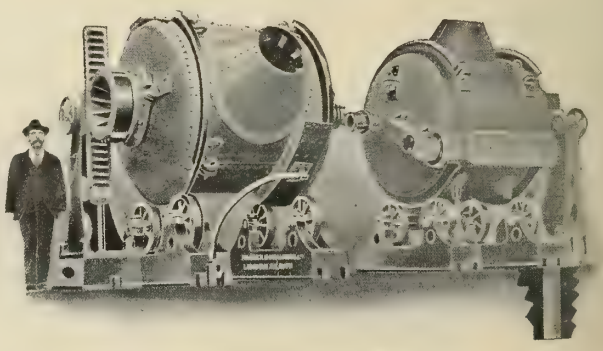
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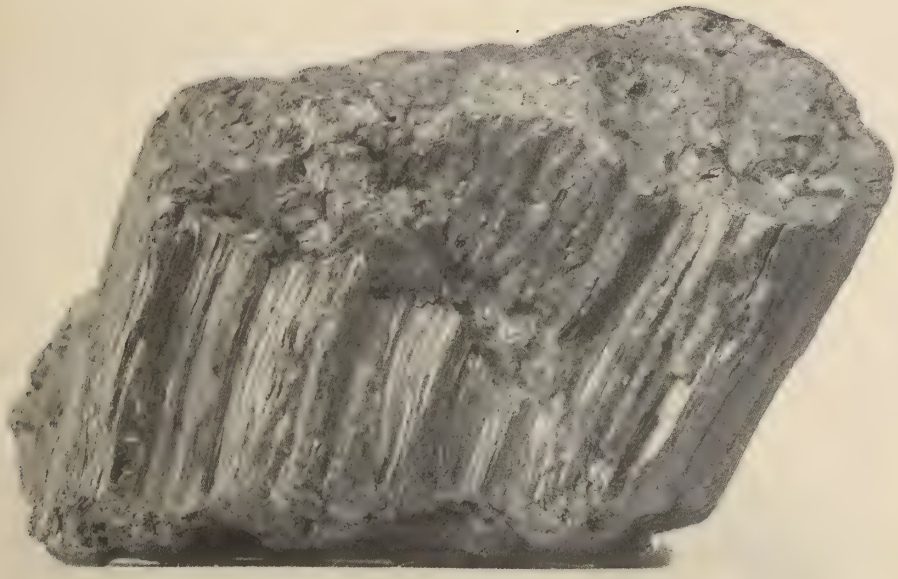
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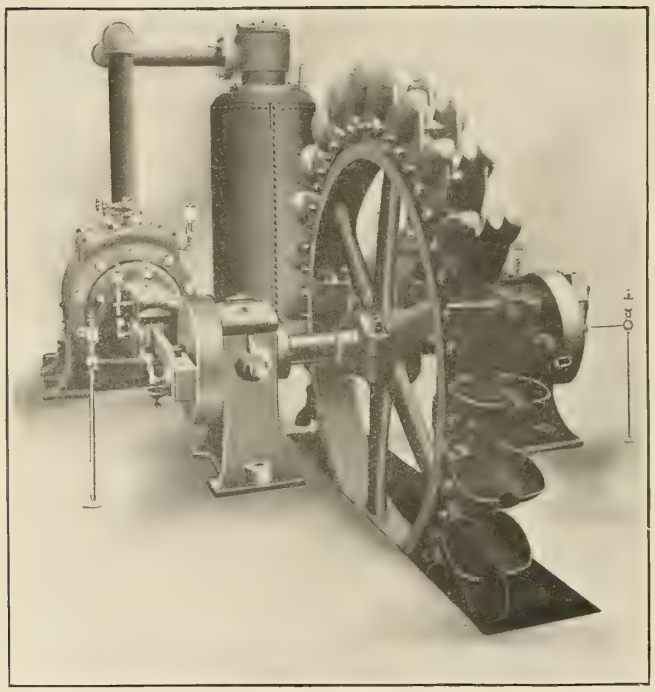


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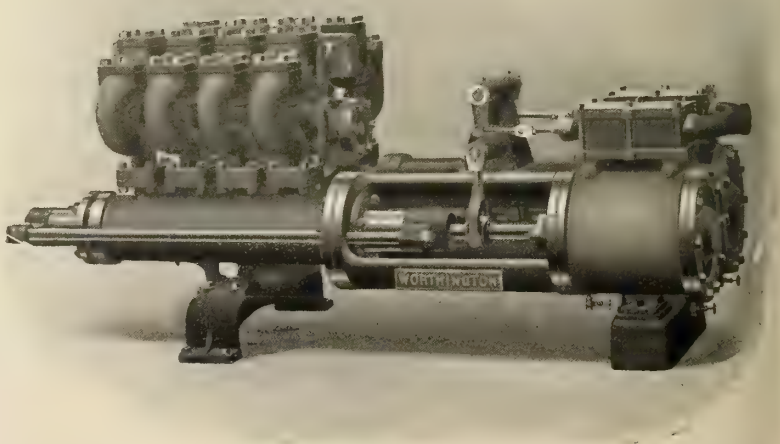
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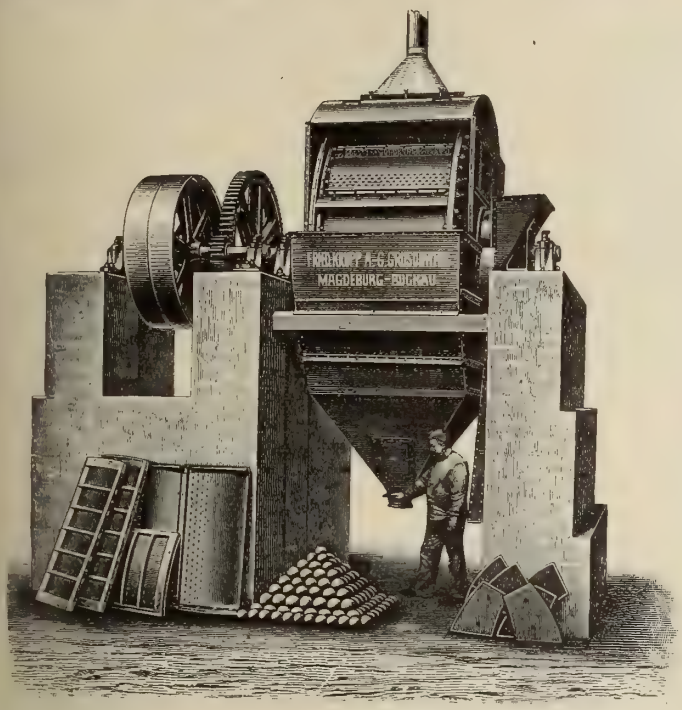
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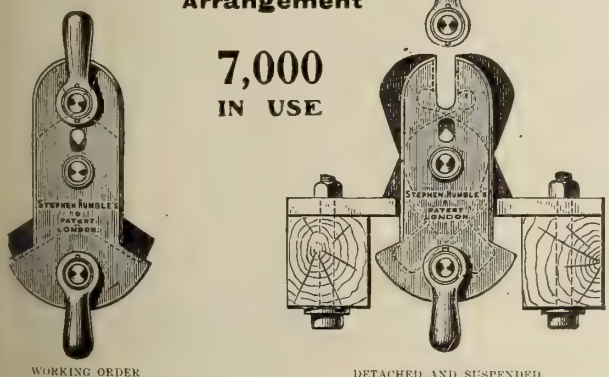
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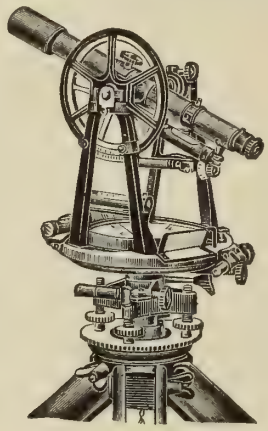
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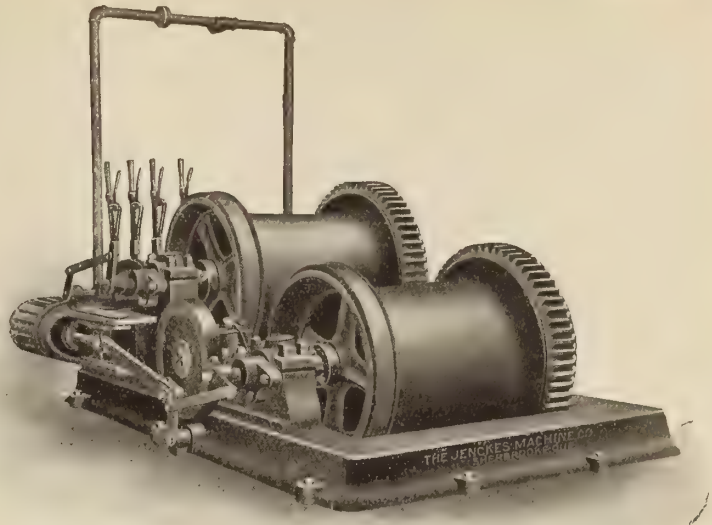
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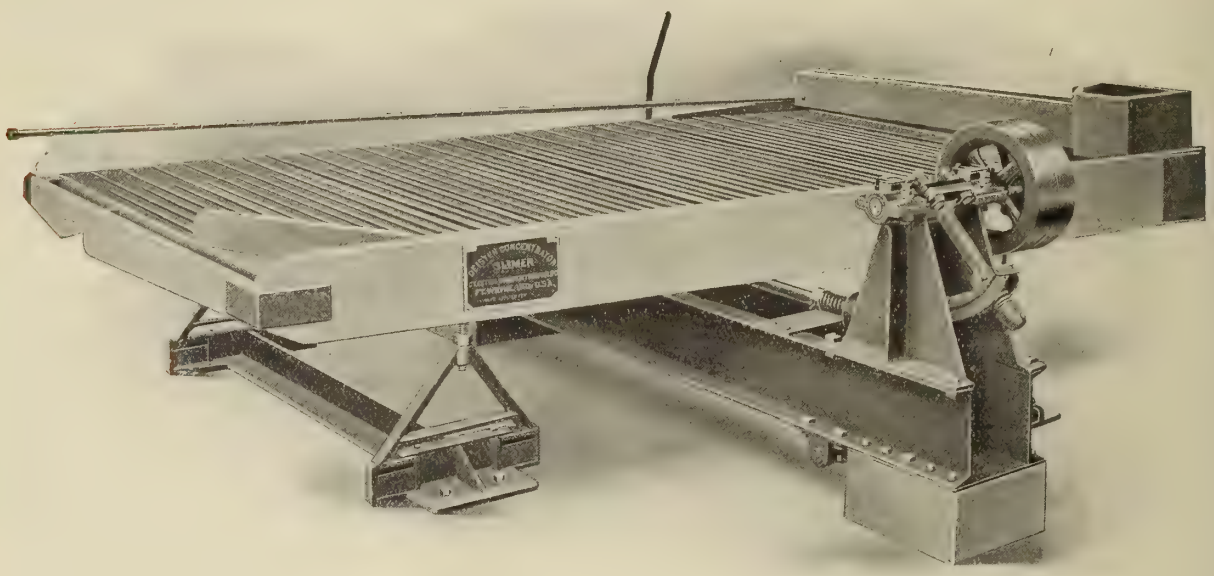
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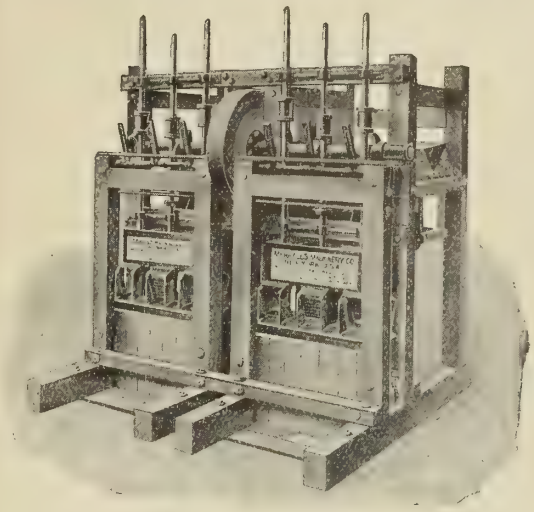
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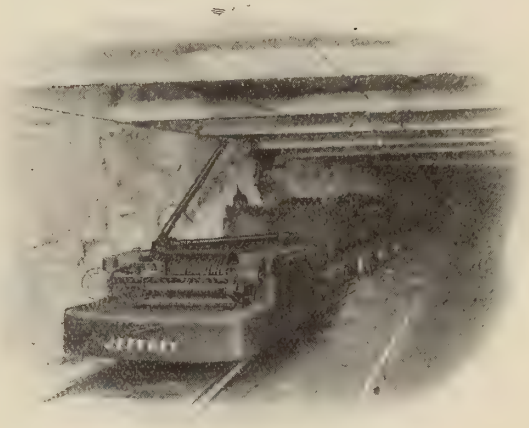
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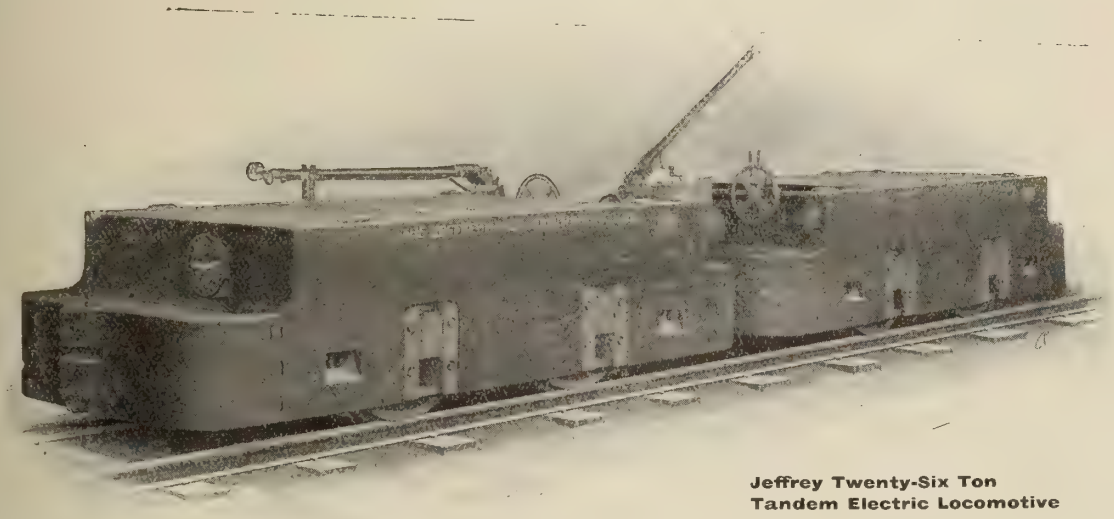


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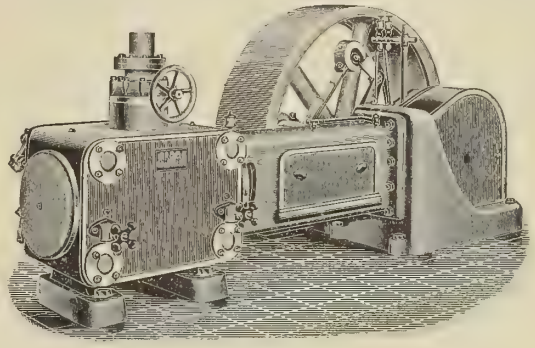
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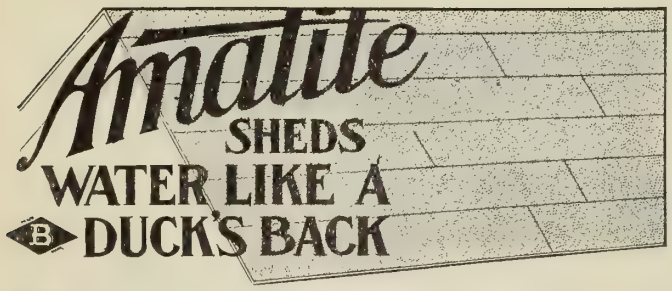
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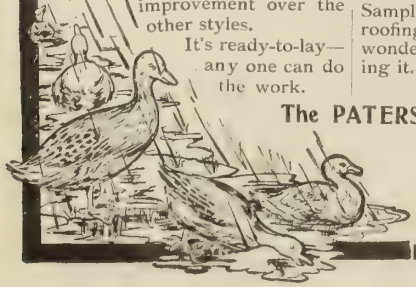
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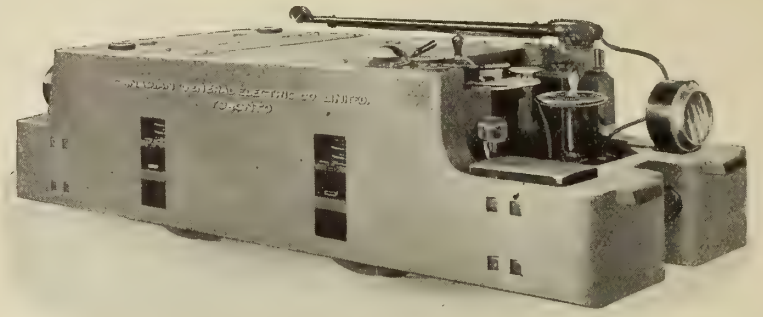
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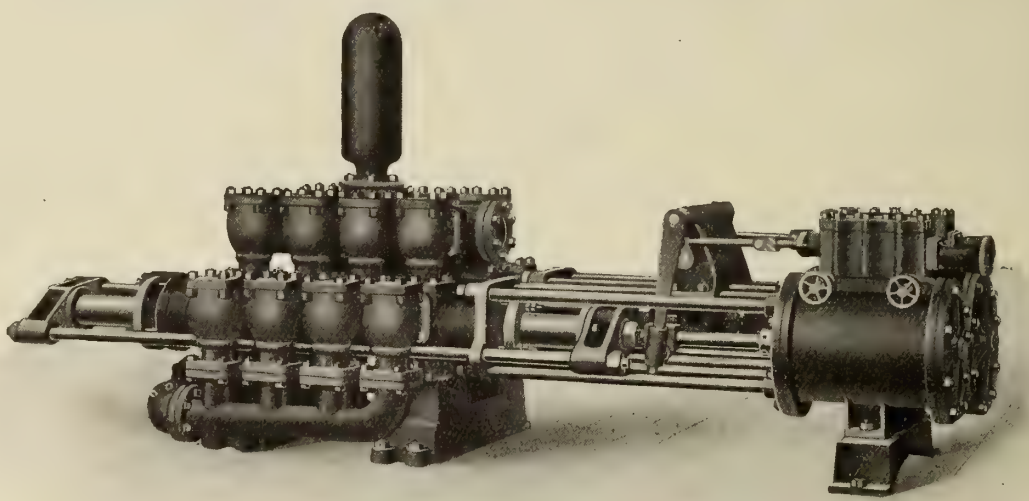
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THE CANADIAN MINING JOURNAL

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Editors:

J. C. MURRAY, B.A., B.Sc. H. MORTIMER-LAMB
Sec. Canadian Mining Institute

Business Manager . . . J. J. HARPELL, B.A.

Asst. Bus. Manager . . D. B. GILLIES, B.A.

Circulation Manager . . . A. P. DONNELLY, B.A.

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario. Dr. J. E. Woodman Dalhouse University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M.E., Nelson, B.C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron and Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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NOTICE

Dishonest persons have been attempting to solicit subscriptions for the Canadian Mining Journal without authorization from this office. They have set the subscription rate at one dollar per annum, and have apparently "worked" several places, with what degree of success we cannot tell.

We wish to warn the public against these tricksters. Our agents are provided with papers and forms which are not obtainable by anybody not employed by us. It is an easy matter to detect an imposter. We shall be grateful if persons having knowledge of an offence of this sort will bring it immediately to our notice.

RECIPROCITY

There is need of systematic interchange of opinions and data between Canadian metallurgists and mining men. The Canadian Mining Institute affords an annual outlet to those having something to say in matters technical. There are, however, emergent problems, more particularly in the field of ore treatment and reduction, that require immediate attention. Take, as an example, the milling of gold ores. We could cite instances of two free-milling ores, identical in character, and being mined within a few miles of each other, receiving totally different treatments in the stamp mill. It is often the case that the stamp mill is designed, and its specifications are filled, not to meet the requirements of the ore to be treated, but rather to conform to the predilections or prejudices of the mill manager. Under circumstances such as these, loss is inevitable. Many a mine has been added to the list of failures because of just such unwisdom. Again, the concentration of ores (such as the ores of Cobalt) is a subject fraught with difficulties. Experience will teach many men different truths. Sooner or later a standard method of concentration for each class of ore will be developed—sooner, and with infinitely less expense to all concerned, if a frank interchange of experience be instituted; later, and at indefinitely greater cost, if each operator hugs his own small fraction of success.

Viewing the subject in general, it should be at once apparent that technical men engaged in any of the various processes of mining and metallurgy have nothing to lose and everything to gain by freely comparing notes at all times and seasons.

NOVA SCOTIA MOVES

While Nova Scotia is supplying her sister Provinces with politicians and the larger sort of educationist, and has been exporting professors to the United States, she has chosen for the head of her new Technical College a native of Cambridge, Massachusetts.

Mr. Frederick H. Sexton, whose appointment to the Directorship of Technical Education in Nova Scotia, and to the Principalship of the Nova Scotia Technical College in Halifax, has just been announced, has for the past four years occupied the chair of Mining and Metallurgy at Dalhousie College, Halifax. During these years he has succeeded in establishing a thorough and eminently practical course of instruction in those important branches. He has acquired, moreover, a knowledge of the peculiar conditions which delimit the industrial development of Nova Scotia, more especially as regards mining and metallurgy. With the initial advantages of youth, of a brilliant academic career at the Massachusetts Institute of Technology, and several years of research work and practical experience in previous appointments, Mr. Sexton is well furnished, professionally, for his responsible task. Further, however, Mr. Sexton, by the quality of his work, by his unwearying enthusiasm and by his unusual modesty, has won the warm friendship of all mining men. The Canadian Mining Journal extends to the new Director its heartiest wishes for all success. Nova Scotia has long needed such an institution as the new Technical College, and, we are confident, such a man to govern it as her newly appointed Director of Technical Education.

ASSAYERS

British Columbia points a moral for Ontario. In the former Province examinations for efficiency in the practice of assaying are held under the direction of a Board of Examiners. Persons wishing to practice as assayers must pass this examination before being granted a license. An entrance fee of fifteen dollars is charged, and successful candidates are called upon for an additional fee of fifteen dollars for their certificates. Candidates are examined on their knowledge of the principles of inorganic chemistry, of sampling, of the qualitative determination of the common elements in ores and furnace products, of assaying of gold bullion, copper bullion and lead-copper bullion, and of ores and furnace products. An adequate knowledge of the methods of analysis of coal, and of the standard methods of determining copper, nickel, iron, lead, lime, zinc, sulphur and silica, must be shown. The candidates are also examined in mineralogy. Graduates of certain Schools of Mines and Colleges are exempt from examinations, and may receive a certificate of competency upon payment of the fee. The examinations are largely practical.

It will thus be readily seen that British Columbia does not recognize as an assayer a man who can merely determine the amount of gold in an ore. The Province very wisely demands that certificated assayers must display a thorough familiarity with all the ordinary processes of qualitative and quantitative analysis. Candidates who come up to the necessary standard are very likely to be men of intelligence and honesty. We venture the statement that had the Province of Ontario exercised the same precautions in restricting the practice of assaying to qualified men, many of the fabulously rich assay returns reported from Larder Lake ores would never have seen the light of day. Some restrictions are absolutely necessary. Ontario cannot do better than to immediately follow the example of her Western sister.

PROSAIC MINERALS

While the mineral riches of New Ontario and the new promise of re-vitalized British Columbia have latterly attracted seekers after wealth, certain prosaic branches of the mineral industry are being carried on with quiet though increasing success. In the last number of the Canadian Mining Journal an outline was given of the extent and importance of asbestos mining in Quebec. The present issue contains an article written by the person who has contributed not a little to developing in Canada a successful graphite industry. In a future issue the mining and working of another economic mineral, mica, will be taken up.

In attacking and removing the difficulties that lay in their paths, the pioneers of these lesser industries had none of the glittering incentives that are held out to the seeker after precious metals. Slowly, surely, but with many discouragements, they have exploited their deposits, solved one by one the problems of mining and treatment, and have obtained a market. In every best sense of the term their work has exemplified the *true business* of mining. The iteration of that phrase, "business of mining," is intentional.

Figures of output are important, but more important is this, that Canada possesses several thriving industries and that these owe their existence to the sane, well-directed, practical intelligence of men who have faith in themselves and in their own country.

The Federal Government has devised new legislation which will undoubtedly be acceptable to Western coal consumers. It is provided that in Manitoba, Saskatchewan, Alberta, and Yukon Territory coal mining rights may be leased for twenty-one years at an annual rental of one dollar per annum, payable in advance. No applicant shall be allowed to lease an area larger than 2,560 acres. The area taken up by one applicant must not exceed four miles in its greatest dimension, and all holdings by one person must be contiguous. Applications are made through the Dominion Lands agent or through a sub-agent of the district. Thirty days are allowed an applicant for registering a location in unsurveyed territory. The lease includes only coal mining rights. The Minister may, however, permit the purchase

of the surface rights of whatever land in the location he deems necessary for the efficient working of the coal mining rights, at the rate of $10 per acre.

The phenomenal drop in Foster (Cobalt) stock, for which no cause is publicly assigned, should be taken as a note of warning. The Foster Mine is, so far as we know, a well-managed mine. It has been and will be a producer. To give anything approaching an adequate return on its heavy capitalization, it must be developed conservatively, and with an eye to the future. An attempt to secure an immediate heavy output might not only diminish the possibilities of the mine, but might fatally handicap it. If this then is true of the Foster, if the stock of a developed mine, with a generally acknowledged claim to fair prospects, is so sensitive to apparently unfounded rumors, what may we expect of the dozens of Larder Lake and Cobalt flotations that have no reason for eixstence beyond a title from the Government, a man-hole in the ground, and a broker's fervent desire to get into the public's pocket!

Here we may pause to observe that several Toronto mining brokers and promoters are advertising lavishly in the press of the Western and Maritime Provinces. We wish to warn those who are desirous of risking their money in mining ventures to refrain absolutely from purchasing stock in Larder Lake or Cobalt concerns, until they have consulted either the Ontario Bureau of Mines or some competent and reputable mining engineer. This is a re-iteration of what has been said before. But so glaring, so patently unsound are the statements made in the "display" advertisements, that they provoke renewed attention. A contemporary mining periodical cites an instance which may well be taken to heart. The L. M. Sullivan Company, of Nevada, a lavish advertiser, received as much as $140,000 in a single day from the sale of mining stocks which it was promoting, yet so tremendous were its expenses that the company failed and had to be reorganized. Advertising was the largest item in its expenditure.

Larder Lake has not yet a mine, much less a producing mine. What conceivable right can any firm of brokers, or any group of promoters, have to spend hundreds of dollars daily in advertising totally undeveloped possibilities? What law sanctions this misappropriation of monies received for an entirely different purpose? But why invoke the law! It is surely not vain to appeal to the common business sense of the long-suffering public!

AMERICAN MINING INSTITUTE

It is announced that arrangements have been consummated for holding a summer meeting of the American Mining Institute in Toronto. The date set is in July. More specific information will be forthcoming later. After a brief session in Toronto the members of the Institute will visit Cobalt, Copper Cliff and various other mining centres. The visit has been arranged largely by officials of the Ontario Bureau of Mines. The local Government is giving assistance, and it is expected that all mning men will heartily co-operate with the orginators of this movement. The American Mining Institute counts among its members nearly every prominent mining engineer in the United States. Its membership also includes many Canadians. As honorary members, it has enrolled the leading scientists of Europe. Toronto should heartily welcome this distinguished body of visitors.

EDITORIAL NOTES

Aluminium may, doubtless will, displace copper to a limited extent for certain incidental purposes. But the supply of aluminium is still insignificant as compared with the output of copper. And even were the world's supply of aluminium increased until it equalled the amount of available copper, it would have very little effect upon the price of the latter metal. For electrical uses copper is incomparably superior to aluminium, and will always be in demand. However, there are a hundred uses to which aluminium could be profitably put were there a more bountiful supply.

CANADIAN GRAPHITE

By H. P. H. Brumell, M.E., Buckingham, Que.
(Toronto Meeting, 1907.)

Of the many useful minerals of common occurrence and wide distribution in Canada, probably less is known of graphite than any other, yet in a quiet and unostentatious way there is being developed an industry in this mineral that promises, in the near future, to be of no small importance to the Dominion. Already there are several companies busily at work with the expectation of producing considerable quantities during the present year. Unfortunately, with regard to the higher grade of graphite (the so-called flake or crystalline quality), the business becomes a milling rather than a mining one as the ore is usually a disseminated one, requiring expert knowledge and special machinery. In the latter respect careful experiment has been required, and the present apparent success has only been won by large expenditure of both time and money.

The industry, which dates back to about 1860, has not until very recently been successful in this country, although with leaner ores it has been profitably conducted in the United States for many years, notably by the Joseph Dixon Crucible Company, the pioneers, on this continent, in the production of graphite from low percentage ores. They began operations as early as 1827.

Character of Graphite.—This mineral, which is, according to locality, termed graphite, plumbago or black-

lead, is essentially a crystalline form of carbon, although its occurrence in that form is practically unknown. It has a specific gravity of from 2.09 to 2.29, according to the percentage of impurity almost invariably found with it; is steel-grey to black in color; feels greasy; lustre, in the crypto-crystalline form, metallic; laminæ thin, flexible and inelastic. The impurities referred to above are usually some form of iron or calcite, while in an ore mined at Calabogie, Ont., the foreign substance is almost invariably one or other, as yet undetermined, of the chlorite group. For commercial purposes and those of this paper the mineral may be divided into three groups, viz., anthracite, amorphous and crystalline, the last being again divided into "vein" and "disseminated" ores. Of the anthracite variety there is a comparatively large deposit near Lepreau Harbor, on the Bay of Fundy, N.B., while the amorphous is found at a number of points in Nova Scotia, New Brunswick and Ontario. The last and most important variety is found, in commercial quantities, to a very great extent in the Archæan rocks lying to the north of the Ottawa River, and to a smaller extent in these rocks in Eastern Ontario. Although widely distributed over large areas of both these Provinces, the most important deposits of economic value in Quebec are confined to the Counties of Labelle and Argenteuil, while in Ontario the Counties of Lanark and Renfrew show a considerable development.

As to the relative value of disseminated and vein ores the writer has always held that the advantage has lain with the former variety by reason of its uniform character and continuity of deposit. Experience in the mining of both has proved this, and the writer is upheld in his opinion by the late H. G. Vennor, who, in the Report of the Geological Survey, 1873-4, writes: "Pure as is this vein-form of graphite, my experience shows that it is to the bedded deposits of this mineral that we must look for our chief supplies, and in this opinion I follow Sir William E. Logan, who, in the report already cited, says: 'The veins of this mineral hitherto found in the rocks of this country, although affording a very pure material, appear to be too limited and too irregular to be exclusively relied on for mining purposes, which should rather be directed to making available the large quantities of graphite which, as we have seen, are disseminated in certain beds.' Such beds are particularly well developed in the portion of Buckingham examined, as well as in the contiguous Township of Lochaber."

Distribution.—It has not been thought necessary for the purpose of this paper to go very deeply into the geographical distribution of this mineral, as very good descriptions of most of the known deposits may be found in the reports of the Geological Survey of Canada; nor is it necessary to go into its geological history for the same reason. Speaking generally, the only deposits of value are confined to rocks of pre-Cambrian age, the mineral being found usually in the Grenville series, or upper beds of the Laurentian system. Certain less important deposits of amorphous ore are occasionally met with in rocks of Devonian or lower Carboniferous age.

It may not be amiss to quote here a brief but very interesting description of the occurrence of graphite in Ceylon. This description constitutes part of the report of Mr. Joseph Hyde Pratt on Graphite in the "Mineral Resources of the United States" for 1904:—"The bulk of the world's supply of the crystalline graphite is obtained from the Island of Ceylon. These deposits are located in the western and southwestern portions of the island, the mineral area in which the graphite occurs being approximately 95 miles long in a north and south direction, with a width of 5 miles at its northern and of 43 miles at its southern end. The commercial graphite deposits occur in veins which traverse a garnetiferous granite rock. These veins vary in width from a few inches to 8 feet, and one has been followed to a depth of 720 feet; but from all accounts such a depth is exceptional. Horizontally the veins are very irregular and limited, and well-defined veins constantly pinch out. There does not seem to be any evidence of a main lode or series of lodes in any part of the district, but there appear to be two zones of the country rock, 4 miles and upward in width (the widest part being 20 miles), which seem to contain the veins that carry the graphite. These deposits have been described in some detail by Mr. George S. Stonier in a paper presented before the Insti-



BUCKINGHAM GRAPHITE COMPANY, BUCKINGHAM, QUE. General View of Works.

tute of Mining Engineers of London, entitled 'Graphite Mining in Ceylon and India.' He states that horizontal veins seem to be entirely disconnected, and that not only is there no indication of a main lode, but that there does seem to be even a series of connected lodes or veins. A vein four inches wide is considered as profitable mining. The largest mass of graphite which has been discovered in this district weighed nearly 6 tons. From the data at hand, Mr. Stonier considers that the fissures were formed first, and that the graphite, quartz, etc., were deposited in them. The graphite may have been introduced by

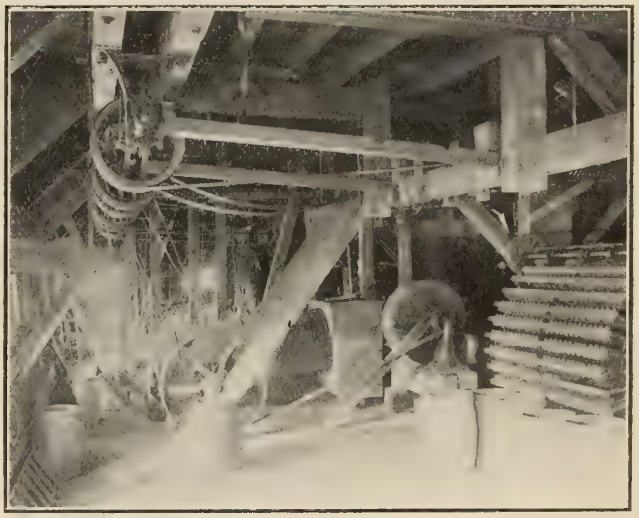


Buckingham Graphite Company's Mill, Buckingham, Que.

sublimation, not of carbons, but of hydrocarbons, as is suggested by the fact that a deposition of graphite-like material is often found in the cracks of upper layers of coke made in the closed ovens.

"There are about 300 mines and quarries in operation, which, with the exception of 3, are all worked by the old native methods. Attempts have been made to work the graphite deposits by modern methods, but on account of the uncertainty of the occurrence of the graphite, it has been found more profitable thus far to work the mines according to the old methods. This generally means that the graphite deposits are simply worked to water level. This is done by means of shallow shafts sunk 50 or 60 feet, the ore being hoisted in barrels and the mineral conveyed in boxes to the dressing sheds, where it is roughly picked and packed in barrels for transit to the shipping port, either Colombo or Galle. Here the graphite is resorted and screened, the larger pieces being broken up. In some cases the poorer portions are further concentrated by washing. It is then classified into five sizes, known as lump, ordinary, chips, dust, and flying dust, and these grades are further divided according to quality. It is estimated that Ceylon furnishes about 30 per cent. of the world's output of graphite and 75 per cent. of the value."

Origin.—Regarding the origin of graphite there has been no small amount of controversy, equally strong claims being set forth to prove an organic as those pointing to an inorganic origin. It is not considered necessary, nor within the province of this paper, to go into the subject deeply. Attention may, however, be drawn to two points, which, in the writer's opinion, would point to an inorganic genesis. First the occurrence of graphite in the silver veins on Silver Islet on Lake Superior. In his report on "Mines and Mining on Lake Superior" (Geological Survey Report, 1887-88) Mr. E. D. Ingall says:—"Graphite also occurs in considerable quantity and seems to be connected in some way with the occurrence of the silver. On enquiring of Mr. R. Trethewey as to what connection he had noticed between the existence of this graphite and the occurrence of the silver, with a view to ascertaining its value as an indication, he told me that although they never had silver without graphite, they sometimes had graphite without silver" . . . "In a specimen of the ore collected by myself are to be seen pieces of trap and graphite enclosed in pink spar, whilst in the graphite start out dendrites of silver." Secondly, and coming directly under the observation of the writer, and applying to practically all the deposits in Labelle County, is the fact that wherever the beds of disseminated ore are cut or in any way traversed, as they often are, by diorite, or other dikes, there is a very pronounced enrichment of graphite. At these points there is always an entire absence or marked lessening in quantity of calcic carbonate (calcite) and a very considerable quantity of calcic sulphate (selenite), while the pyrite is replaced by pseudomorphous ferric oxide. Without going into a lengthy argument on the above, might it not be concluded that under certain favorable conditions the calcite gave up part of its carbon, which was re-deposited as graphite, while the pyrites afforded the sulphur which, with the calcium, produced the selenite, leaving the iron to be resolved into ferric oxide. Again, all the known deposits of vein graphite occur in intrusive masses of diorite or pegmatite. Prof. A. Osann, of Mulhausen, Alsace, writes (Rep. Geo. Surv. 1899):—"The occurrence of graphite at Graphite City is connected with the appearance of massive eruptive rocks which in mineralogical composition are very similar to those described in connection with the apatite occurrence." . . . "As far as I could see on my short visit, the occurrence of the graphite is connected with the contact of this eruptive rock with gneiss and granular limestone. The limestone is in these places very much altered; there has been especially a large production of scapolite, pyroxene and titanite."

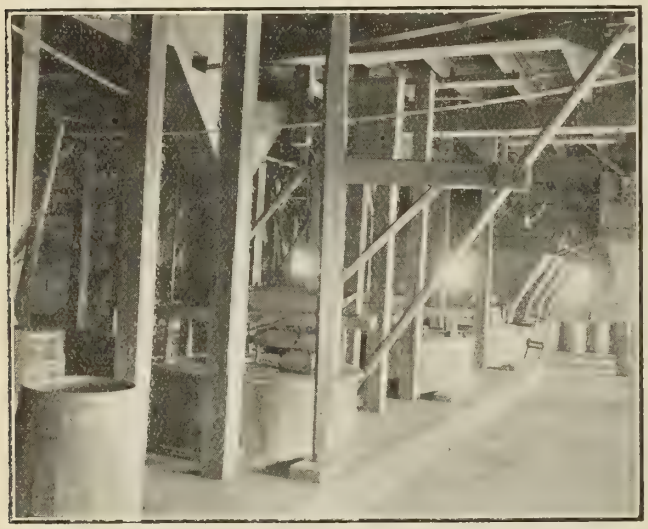


Part of Concentrating Plant, Buckingham Graphite Company, Buckingham, Que

In the limestones, as at Grenville and Calumet, the mineral occurs invariably as segregated masses rather than in veins. In writing the foregoing, reference is made only to the occurrence of the mineral in pre-Cambrian rocks; the amorphous graphite of Devonian and lower Carboniferous age being very probably due to the carbonization of organic remains.

History.—The history of graphite may be given in but few words. Knowledge of the existence of the mineral in Canada antedates the birth of our Geological Survey,

whose staff was, however, not long in taking cognizance of its existence. On 20th June, 1860, Mr. William E. Logan, later Sir William E. Logan, issued a circular letter from Toronto, asking for specimens for the Grand Industrial Exhibition to be held in London the following year, and we find in the catalogue of the Canadian exhibit, note of a specimen of plumbago from Lot 10, Range 5, Township of Grenville, Argenteuil County, Quebec, with the remark that there were two veins. Again in 1862, at the London International Exhibition, the Geological Survey exhibited specimens from Pointe du Chene, Grenville, and Lochaber, in Quebec. Shortly after, in 1867, work was begun in earnest and a small mill erected by the Canadian, afterwards the Montreal Plumbago Company, on a water power on Lot 28 in the Fifth Range of Buckingham Township, Labelle County, Que., the ore being obtained from Lot 28 in the Sixth Range, immediately to the north, and known as the "Castle" property. This mill was operated successfully until 1872, after which work was not carried on very actively, the only product being stove polish, made from material previously mined and at the mill. In 1873, the mill was destroyed by bush fires and all operations ceased.



Part of Finishing Plant, Buckingham Graphite Company, Buckingham, Que.

Work at about the same time was being prosecuted on a pure lump vein by Messrs. Pew & Weart on lots immediately to the east, and shortly afterwards a mill was erected in Lochaber Township on the Blanche River by the Lochaber Plumbago Mining Company, the ore to supply which being obtained from lots to the north, in the neighborhood of Long Lake. This mill proved unsuccessful, and, after treating some 600 to 700 tons, was abandoned. In reference to this mill, and in general to graphite mining in the County of Labelle at that time, Mr. H. G. Vennor writes (Rep. Geo. Surv. 1876-77) :— "From information gathered from several of the old settlers in this Township, I learned that the mining operations had been conducted here in a most unsystematic manner, and this fact was borne out by the shape and position of many of the openings which had been made. Mr. Pearce, who acted as general mining captain for this company, spent much of his time in devising plans for the mechanical separation of the plumbago from foreign matter, but with the exception of making some amusing mechanical toys, and adding greatly to the working expenses of the company, accomplished but little. While Mr. Pearce thus experimented, each miner was his own mining captain, and, as might have been expected, the greatest confusion prevailed until the company suspended work. I mention these facts here to explain the true cause of the total failure of this mining enterprise in Lochaber, for the suspension of work at one after another of the plumbago mines in both Buckingham and Lochaber has greatly discouraged those who are interested in their development. In conclusion, I would remark that plumbago yet abounds in both Buckingham and Lochaber, and all that is requisite for its successful mining is a cheap and effectual method of separating it from the impurities which are mechanically mingled with it." During 1875-76 the Dominion of Canada Plumbago Mining Company erected an extensive mill on Lot 19 in the 8th Range of Buckingham, which was in operation for some years. Lack of proper management and an over lavish expenditure of money, however, forced the company into bankruptcy in 1879, when the extensive property was bought in and the business rehabilitated under the name of the Walker Mining Company, which continued somewhat intermittently to operate the property until 1895, when all work ceased. The property lay fallow until 1905, when it was taken up and has since been operated by the Buckingham Graphite Company. In 1890 a mill was erected on the Pew & Weart property, north of Donaldson Lake, on Lot 26, Range 6, of Buckingham. It was re-built in 1892, and continued to produce in a spasmodic manner until about 1900. In 1872 a mill was built and operated at Oliver's Ferry, Ontario, with, it is said, considerable success, the ore being obtained from Lot 21, Range 6, Township of North Elmsley; details as to subsequent years are not available. This is, as far as is known, the only mill erected in Ontario in the early stages of the industry.

To come down to more recent years, the mill of the North American Graphite Company was built on Lot 28, Range 6, Township of Buckingham, in 1895, and in 1904 the mill of the late Walker Mining Company was entirely remodelled by the Buckingham Graphite Company. In Ontario, the mill of the Ontario Graphite Company was erected in 1902, and continued in operation for about a year, when a cave-in of the roof under Whitefish Lake flooded the mine, and all work was abandoned. In the same year the Globe Refining Company erected a small mill at Port Elmsley, which is in operation, though not financially successful, it is said, at the present time. Two mills are at present being erected, one near Calumet Station on the Canadian Pacific Railway, and another on the Lievre River, about six miles north of Buckingham, while extensive development work is being carried on at the Belle Mine, about three miles east of Buckingham. Rumor says that a mill will be erected on this property during the coming spring.

Crude ore has been, in the past few years, shipped from several points in Canada, the most important producers being the Ontario Graphite Company, who exported large quantities of amorphous ores, from their mine in Brougham Township, Ontario, previous to the flooding of their pit. Large quantities of a poorer quality of amorphous ore were shipped from Allanhurst, in Ontario, and from St. John and Petitcodiac in New Brunswick, while a considerable shipment of flake or crystalline ore was made from Grenville, Quebec, by the Keystone Graphite Company in 1900.

Methods.—Like many other industries not wholly proven, there is, in the treatment of the ore, a considerable amount of secrecy observed, which makes it very difficult to write with confidence of the various methods

employed. Speaking generally of the earlier efforts at milling, it may be said that in all instances the operators used the old system of stamping: in point of fact, with the exception of the Pew & Weart mill, all mills were so equipped until 1902, when the first dry mill was erected by the Globe Refining Company at Port Elmsley, Ontario. This company was followed, in 1903, by the Anglo-Canadian Graphite Syndicate of Birmingham, England, who took over the mill erected by the North American Graphite Company and rebuilt it on a dry principle, different, however, to that of the Globe Company. In the earlier mills, after crushing and stamping, concentration was had by stationary buddles, and, in some of the earliest plants, by keeves. The concentrates, after drying, were put through a system of buhrstones and revolving screens, until they were more or less finished, the resultant products being then graded for the various markets for which they were intended. At the mill of the Globe Refining Company, while the writer has not personal knowledge, concentration is had, after crushing and rolling the ore, by means of the Krom Separator or pneumatic jig, after which the concentrates are bolted and only two grades made, all material finer than 60 mesh being discarded. The plant erected by the Ontario Graphite Company in Brougham Township, Ontario, is equipped with the old, and now obsolete, system of stamps and buddles; a treatment to which the ore does not readily lend itself. This ore is unique, inasmuch as that it is practically amorphous, carrying about 10 per cent. of crypto-crystalline or flake graphite, and as both varieties are similar in gravity, but a very poor separation is made. As the crushed and buddled ore had to be dried after the so-called concentration and all the material in the buddles moved by hand, it will be seen that considerable extra expense was saddled on the finished product. The mill of the late Anglo-Canadian Graphite Syndicate, formerly the North American Graphite Company, was originally equipped with stamps and buddles but was, under the regime of the former company, remodelled and now contains Blake and roll-jaw crushers, between which the ore is dried by means of a cylindrical revolving fuel dryer. After coming from the roll-jaw crusher the ore passes through two sets of ordinary belted rolls, passing thence to a series of sizing screens, fitting it for the dry pneumatic concentrators. The tailings from these machines are then treated on the Brumell concentrator, a wet separator which relies on the floating quality of graphite, when dry, upon the moving surface of a body of water. The resultant concentrates from this wet separator are then dried by means of a revolving steam drier when all concentrates are taken to the buhrstones, by means of which, with the necessary accompanying screens and graders, the material is finished and ready for market. The mill of the Buckingham Graphite Company is equipped similarly to the foregoing, though its capacity is very much greater. In this mill the roll-jaw is replaced by a Gates rotary crusher and, in addition, a dry separator, known as the barrel concentrator, is used. In regard to the mills being erected at Calumet and Buckingham, great secrecy has been observed, and it is only from hearsay that the writer is led to say that the methods to be employed will be practically the same as are now used at Port Elmsley, Ont.

Market.—Much has been said, in the markets of the world, with a view to creating a prejudice against Canadian flake graphite, and as the trade has always looked to Ceylon, and old established connections still hold with that country, it has been found no easy matter to introduce the Canadian product. However, as we are now putting on the market material of such high percentage and have always maintained an uniformity of product, we are gradually breaking down the barrier of prejudice and annually gaining ground in the open market. As illustrative of the purity of our finished material, the following assays, made from stock, may prove of interest:—

I.—By Milton L. Hersey, Montreal, from Anglo-Canadian Syndicate Mill.

II.—B. A. E. Tucker, Birmingham, Eng., Anglo-Canadian Syndicate Mill.

III.—By Milton L. Hersey, Montreal, from Buckingham Graphite Company Mill.

	I.	II.	III.
GR	93.96	94.68	96.10
GA	93.80	94.63	96.08
GP	94.14	94.24	93.60
GH	93.94	94.49	94.90
GI	93,50	94.04	96.51
GT	92.74	93.16	81.16
GE	91.18	91.77	77.90
G12	.....	.....	78.08
No. 80	.....	.....	71.30

The foregoing stocks are of higher percentage than any other similar ones now on the market.

In his report on Canadian Graphite, Mr. G. C. Hoffmann (Rep. Geo. Surv. 1876-77) goes very thoroughly into the relative value of Canadian graphite compared with that of Ceylon, which is, and has always been, taken as par. In summing up his work, Mr. Hoffmann says: "From these experiments it will be seen that in respect to incombustibility the Canadian graphite may claim perfect equality with that of Ceylon; and that consequently—apart from any consideration of the proportion and nature of the associated foreign matter—it is in no wise inferior to the latter as a material for the manufacture of crucibles." In this report it will be seen that high percentage graphite was being produced, though not with financial success, as early as 1876, during which year the Dominion of Canada Plumbago Mining Company produced and marketed a small quantity of the following grades:—

A0.—For electrotyping, 82.31 per cent.
A1—For lubricating, 94.85 per cent.
A2—For lubricating, 89.26 per cent.
A3.—For crucibles, 92.35 per cent.
A4.—For crucibles, 94.30 per cent.
A5.—For crucibles, 95.59 per cent.
A6.—For crucibles, 96.36 per cent.

The following tables, from the same report, will illustrate the relative graphite values of vein graphite from Canada, Ceylon and Ticonderoga, N.Y. (the mines of the Joseph Dixon Crucible Company):—

Buckingham, vein graphite, variety foliated, sp. gr. 2.2689 carbon 99.675.

Buckingham, vein graphite, variety columnar, sp. gr. 2.2679 carbon 97.626.

Grenville, vein graphite, variety foliated, sp. gr. 2.2714 carbon 99.815.

Grenville, vein graphite, variety columnar, sp. gr. 2.2659 carbon 99.757.

Ceylon, vein graphite, variety foliated, sp. gr. 2.2664 carbon 99.679.

Ceylon, vein graphite, variety columnar, sp. gr. 2.2671 carbon 99.792.

Ceylon, vein graphite, variety foliated, sp. gr. 2.2484 carbon 99.284.

Ceylon, vein graphite, variety columnar, sp. gr. 2.2546 carbon 98.817.

Ticonderoga, vein graphite, variety foliated, sp. gr. 2,2599 carbon 96.656.

Ticonderoga, vein graphite, variety foliated, sp. gr. 2.2647 carbon 97.422.

After careful experiment, Mr. Hoffmann prepared and incorporated the following table as illustrative of the relative combustibility of Canadian graphite when compared with that of Ceylon, the latter being taken as par:—

Ceylon, vein graphite, variety foliated, 1.00.
Ceylon, vein graphite, variety foliated, 0.99.
Ceylon, vein graphite, variety columnar, 1.01.
Ceylon, vein graphite, variety columnar, 1.25.
Buckingham, vein graphite, variety foliated, 1.00.
Buckingham, vein graphite, variety columnar, 1.01.
Grenville, vein graphite, variety foliated, 1.02.
Grenville, vein graphite, variety columnar, 1.12.
Buckingham, disseminated, 1.02.
Buckingham, disseminated, 1.01.

Demand.—Generally speaking, the graphite industry has, for some years shown a marked annual increase, due, largely, to the development of electricity and consequent increased use of copper and its alloys, while, notwithstanding the introduction of open hearth steel, the demand for steel crucibles appears to increase. The average price, as well as the production, has also very materially increased, as is evidenced by the fact that in 1895 the combined markets of the United States and Great Britain were 23,513 tons, valued at $1,199,722, or $51 per ton, while in 1902 (the latest figures available to the writer) the same was 34,474 tons, valued at $3,321,525, or $96.45 per ton, of all grades. The fact that high grade Ceylon "lump" sold in 1895 for from three to four cents per pound, and is now selling for from six and a half to nine cents, according to quality, shows either a shortage or an increased demand. If all the mills now built, or in course of construction, were operating to their full capacity and turning out goods of high quality, there would be no difficulty in disposing of their production, as there are in the United States alone crucible manufacturers enough to take all the high grade flake produced, while the stove polish, paint, foundry facings, lubricating and electrotyping trades would easily look after the balance. Again, there is a very large market in Europe, especially in London, Hamburg and Vienna. It may be of interest to know that the North American Graphite Company were, in 1895, very glad to get three and a half cents for flake, while the Buckingham Graphite Company are, to-day getting for the same quality from six and a half to nine cents per pound. During 1902 only about one-tenth of the consumption of graphite in the United States was of domestic origin.

Mr. Joseph Hyde Pratt, in the "Mineral Resources of the United States" for 1904, gives the consumption of crystalline graphite, in the arts and manufactures, approximately as follows: For crucibles, 55 per cent.; stove polish, 15 per cent.; foundry facings, 10 per cent.; paint, 5 per cent.; all others, 15 per cent. The last named division includes powder polishing, electrotyping, steam packing, pencils and various minor uses

Uses.—To go thoroughly into the subject of the various manufactures of graphite and the many uses to which it is put would require a paper much longer than this. In addition to those mentioned by Mr. Pratt, it enters largely into the manufacture of shoe polish, printer's ink, electric light carbons, electrodes, rheostats and other electrical appliances and supplies, and is used by shot, bolt and nut, piano, wire, hat, and many other manufacturers; the means of using it are, however, not all known to the writer. As a lubricant, graphite has attained in late years a position of considerable prominence, and its use as such is rapidly growing. In the original Webster's Dictionary we find a lubricant defined as "that which lubricates: specifically, a substance, as oil, grease, plumbago, etc."



DIAMOND GRAPHITE COMPANY'S MILL, BUCKINGHAM, QUE. View from South-East.

William Kent, M.E., in his "Mechanical Engineers' Pocket Book," says: "Graphite in a condition of powder is used as a solid lubricant, so-called, to distinguish it from a liquid lubricant, has been found to do well where the latter has failed." Rennie, in 1829, says: "Graphite lessened friction in all cases where it was used." General Morin, at a later date, concluded from experiments that it could be used with advantage under heavy pressures; and Professor Thurston found it well adapted for use under both light and heavy pressures when mixed with certain oils. It is especially valuable to prevent abrasion and cutting under heavy loads and at low velocities.

At a meeting of the American Society of Mechanical Engineers, held in New York, in December, 1895, Pro-

fessor Albert Kingsbury, of Durham, N.H., read a paper on "Experiments on the Friction of Screws," wherein he describes certain tests made by himself. The author did not consider that the tests showed that any one of the metals developed less friction than any of the others, but the tests are specially interesting because of the great lessening of friction by means of graphite, as is shown by the following:—

Lubricant.	Mean.
Lard oil, heavy machinery	11
Oil (mineral), heavy machinery	14
Oil and graphite (equal volumes)	07

The following notes are taken from a pamphlet on lubrication, issued by the Joseph Dixon Crucible Company, and refer to part of a report on exhaustive tests made by Professor W. F. M. Goss, of Perdue University: "Graphite does not behave like oil, but associates itself with one or other of the rubbing surfaces. It enters every crack and pit in the surfaces and fills them, and if the surfaces are ill-shaped or irregularly worn, the graphite fills in and overlays until a new surface of more regular outline is produced. When applied to a well-fitted journal, the rubbing surfaces are coated with a layer so thin as to appear hardly more than a slight discoloration. If, on the other hand, the parts are poorly fitted, a veneering of graphite of varying thickness, which in the case of a certain experiment was found as great as 1-16 inch, will result. The character of this veneering is always the same, dense in structure, capable of resisting enormous pressure, continuous in service without apparent pore or crack, and presenting a superficial finish that is wonderfully smooth and delicate to the touch.

"The experiments with flake graphite as a lubricant justify the following important conclusions:—

"(a) The addition of graphite to oil results in a lower frictional resistance of the journal than would be obtained by the use of oil alone.

"(b) When graphite is used with oil, the amount of oil required for a given service is reduced.

"(c) By the use of graphite a light or an inferior quality of oil may be employed for a given service.

"(d) By the use of graphite, water under favorable conditions may serve as a sufficient lubricant.

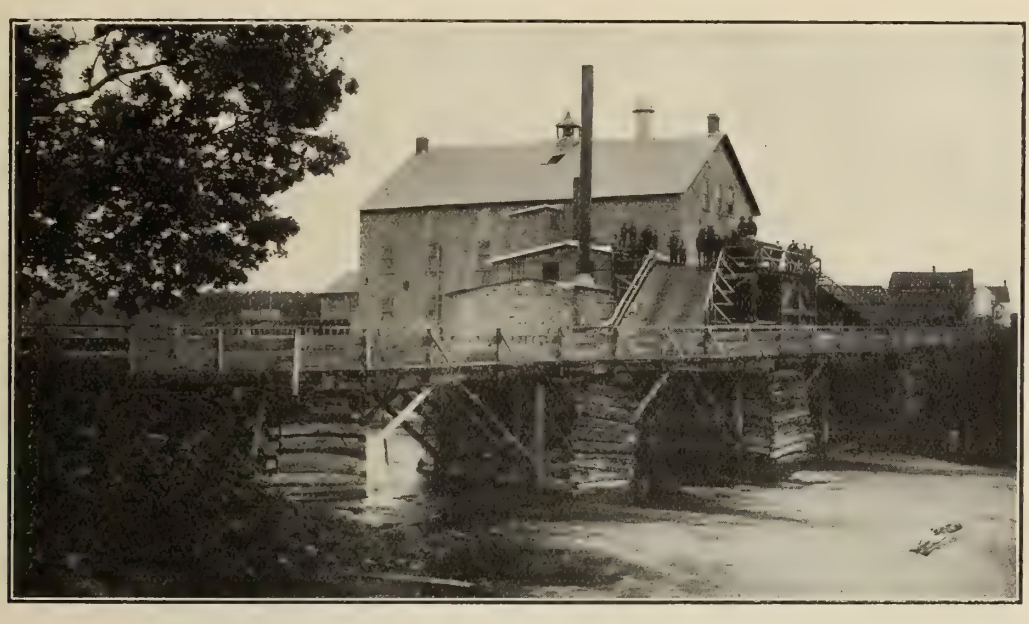
"(e) A small amount of graphite only is required.

"(f) The supply of *too much* graphite unduly thickens the oil and correspondingly increases its internal friction due to viscosity.

"(g) The benefits derived from the use of graphite persist long after its application has ceased. The supply, however, should be constant, though small, for the best results."

In conclusion, it may be stated that, by reason of the high degree of purity attained in the mills of the late Anglo-Canadian Graphite Syndicate and the Buckingham Graphite Company, a considerable demand has arisen for their flake produced for lubrication, both in the United States and Great Britain, as well as in Germany, where graphite lubrication has probably reached its highest point.

Statistics.—It is extremely difficult to obtain correct statistics relative to graphite, more especially on this continent, where it is a notorious face that incorrect returns are almost invariably supplied to the various Government statistical offices, while from the various diverse figures obtainable from official centres of foreign countries it may be assumed that this notoriety is universal.



GLOBE REFINING COMPANY'S MILL, PORT ELMSLEY, ONT. View from South-East

In the following tables it has been the endeavor of the writer to obtain the most correct figures, though, of course, he does not vouch for them.

The annual production and imports and exports of Canada are given in the two following tables, and are taken from the reports of the Section of Mines of the Geological Survey.

ANNUAL PRODUCTION IN CANADA.

Year.	Tons.	Value.
1895	220	$6,150
1896	139	9,455
1897	436	16,240
1898	...	13,698
1899	1,130	24,179
1900	1,922	31,040
1901	2,210	38,780
1902	1,095	28,300
1903	728	23,745
1904	452	11,760
1905	541	17,032

IMPORTS AND EXPORTS OF CANADA.
1895-1905.

Year.	Imports.	Exports.
1895	$38,496	$4,833
1896	40,796	9,480
1897	38,943	4,325
1898	54,153	13,098
1899	62,803	22,490
1900	64,955	46,197
1901	77,893	35,102
1902	67,772	24,839
1903	72,546	43,642
1904	69,546	16,507
1905	.....	8,114

The production, imports and total consumption of the United States are contained in the following tables, taken from the "Mineral Resources of the United States" for 1904.

PRODUCTION AND CONSUMPTION OF THE UNITED STATES.
1895 to 1905.

	Production.		Imports.		Total.	
Year.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1895	3,115	$52,582	8,814	$260,090	11,925	$312,672
1896	1,028	48,460	15,230	437,159	16,258	485,619
1897	1,751	65,730	8,533	270,952	10,284	336,682
1898	2,070	75,200	13,482	743,820	15,552	819,020
1899	3,774	167,106	20,793	1,990,649	24,567	2,157,755
1900	3,365	197,579	14,417	1,390,141	17,782	1,587,720
1901	2,793	167,714	14,325	895,010	17,118	1,062,724
1902	3,297	182,108	18,201	1,168,554	21,498	1,360,662
1903	18,857	225,554	16,007	1,207,700	34,864	1,433,254
1904	19,767	321,372	12,674	905,581	32,441	1,226,953
1905	24,971	318,211	.....	.....	.....	.....

Deducting the cheap and low grade amorphous graphite produced in the United States, and combining the crystalline product only with the imports, we find a market there as follows (the last full figures available):

	Production.		Imports.		Total.		Value
Year.	Tons.	Value.	Tons.	Value.	Tons.	Value.	per ton.
1900..	2,754	$178,761	14,417	$1,390,141	17,171	$1,568,802	$91.35
1901..	1,984	135,914	14,325	895,010	16,309	1,080,924	63.20
1902..	2,088	153,147	18,201	1,168,554	20,289	1,321,701	65.15
1903..	2,269	154,170	16,007	1,207,700	18,276	1,361,870	74.50
1904..	2,840	238,447	12,674	905,581	15,514	1,144,028	73.75

Note.—In the above imports are included large quantities of Austrian crude ore worth only about $14.00 per ton.

The following table, illustrating the world's production, is taken, intact, from the "Mineral Resources of the United States" for 1904.

WORLD'S PRODUCTION OF GRAPHITE, 1895-1903.
(Quantity in Metric Tons.)

	1896.		1897.	
Country.	Tons.	Value.	Tons.	Value.
United States	933	$48,460	1,589	$65,730
Austria	35,972	410,081	38,504	439,610
Canada	126	9,455	396	16,240
Ceylon	10,463	414,405	19,275	1,159,885
Germany	5,248	72,108	3,861	66,126
India	.....	.....	61	316
Italy	3,148	10,193	5,650	11,300
Japan	215	6,925	204	16,075
Mexico	620	5,287	907	8,663
Sweden	14	491	99	3,240
Totals	56,739	977,405	70,546	1,787,185



NORTH AMERICAN GRAPHITE COMPANY'S MILL, BUCKINGHAM, QUE. View from West.

The exports of graphite from the United States would not materially change the above totals. According to official returns, they were in 1901, $365; in 1902, $834; in 1903, $13,365; and in 1904, $12,417.

In the "Mineral Resources of the United States" for 1903, Mr. Joseph Hyde Pratt says:—"The importance of the graphite industry in the United States is well emphasized by this table, and also the benefit that would be derived by this country if large deposits of commercial graphite could be found. There is a general increase in the quantity of graphite consumed, although there has been a very wide variation in the value of the production each year."

	1898.		1899.	
Country.	Tons.	Value.	Tons.	Value.
United States	1,878	$75,200	3,424	$167,106
Austria	33,062	421,058	31,819	395,280
Canada	.....	13,698	1,188	24,179
Ceylon	78,509	9,243,263	29,037	2,904,970
Germany	4,693	97,916	5,196	120,250
India	22	110	1,548	7,572
Italy	6,435	17,423	9,900	55,944
Japan	346	10,265	53	5,120
Mexico	1,857	18,237	2,305	22,847
Sweden	50	1,620	(a)535	1,674
Totals	126,752	9,898,790	85,445	3,704,942

Country.	1900. Tons.	1900. Value.	1901. Tons.	1901. Value.
United States	3,054	$197,579	2,533	$167,714
Austria	33,663	418,126	29,992	369,157
Canada	1,744	31,040	2,005	38,780
Ceylon	19,168	b875,190	22,707	b3,203,215
France	.....	.....	.....	.....
Germany	9,248	136,500	4,435	58,000
India	1,858	9,104	2,530	(c)
Italy	9,720	55,720	10,313	59,211
Japan	94	12,215	88	8,930
Mexico	2,561	25,650	1,473	7,385
Sweden	84	3,186	56	1,900
Totals	81,194	1,764,310	76,226	d3,930,359

Country.	1902. Tons.	1902. Value.	1903. Tons.	1903. Value.
United States	6,085	$183,108	17,110	$225,554
Austria	29,527	368,186	29,589	382,148
Canada	994	28,300	700	23,585
Ceylon	25,593	3,505,455	24,492	1,952,529
France	150	1,140	126	702
Germany	5,023	41,755	3,720	35,462
India	4,648	(c)	3,448	(c)
Italy	9,210	35,934	7,920	28,855
Japan	97	9,876	114	10,950
Mexico	580	3,176	1,952	42,985
Sweden	63	1,900	25	988
Totals	81,970	4,177,830	89,196	2,704,158

(a)—Includes crude.
(b)—These values were taken from the official year books of the United Kingdom.
(c)—Statistics not available.
(d)—Latest available figures used in making up total.

In tabulating the production of the Island of Ceylon, there is to be noted a very great fluctuation, both as to total value and value per ton. It will be also seen that the year 1904 afforded the greatest tonnage, with two exceptions.

PRODUCTION OF GRAPHITE IN CEYLON FROM 1896 TO 1904 (Metric Tons.)

Year.	Tons.	Value.*	Value per ton.
1896	10,463	$414,405	$29.60
1897	19,275	1,159,885	60.20
1898	78,509	9,243,263	117.70
1899	29,037	2,904,970	100.00
1900	19,168	(a) 875,190	50.90
1901	22,707	3,203,215	141.00
1902	25,593	3,505,455	137.00
1903	24,492	1,952,529	79.70
1904	26,478	.....	.....

(a)—These values are taken from the official year books of the United Kingdom.

Artificial Graphite.—The introduction of artificial graphite into the market did not, as was feared at one time, revolutionize the industry, as the production of this substance by artificial means consists largely in the graphitizing of electrodes and similar electrical supplies, small quantities only being produced and sold for the manufacture of paints, dry batteries, commutator brushes, etc. The following notes regarding this product are taken from the "Mineral Resources of the United States" for 1903:—

"Methods for the production of artificial graphite have been known for a great many years, but it is only within the last eight years that a method has been devised for manufacturing it commercially. The three principal methods by which artificial graphite has been made are: (1) By heating amorphous carbon to a very high temperature in the electric furnace. (2) By dissolving an excess of carbon in a molten metal at a high temperature; on allowing the metal to cool down, the excess of carbon separates out as graphite. (3) By the disassociation of certain carbon compounds by means of metallic iron, or iron oxide, at high temperatures. The method now employed in the manufacture of artificial graphite was discovered by Mr. E. G. Acheson, who also discovered carborundum. Mr. Acheson defines his method of manufacture as follows:—'This method of manufacturing graphite I would define as consisting in heating carbon, in association with one or more oxides, to a temperature sufficiently high to cause a chemical reaction between the constituents, and then continuing the heating until the combined carbon separates in the free state. It is not, however, limited to the use of oxides, as pure metals, their sulphides and other salts may be used, but for various reasons the oxides are to be preferred.'" (Jour. Frank. Inst., June, 1899).

The following table of the production of artificial graphite is taken from the "Mineral Resources of the United States" for 1904:—

PRODUCTION AND VALUE OF ARTIFICIAL GRAPHITE, 1897 to 1904.

Year.	Pounds.	Value.	Unit Value per Pound, cents.
1897	162,382	$10,149	6.25
1898	185,647	11,603	6.25
1899	405,870	32,475	8.00
1900	860,750	68,860	8.00
1901	2,500,000	119,000	4.76
1902	2,358,828	110,700	4.70
1903	2,620,000	178,670	6.82
1904	3,248,000	217,790	6.71

OCCURRENCE OF GRAPHITE*

The United Kingdom.—At Borrowdale, near Keswick, in Cumberland, were the only graphite deposits of importance. These gave out before 1843, after being worked for nearly three centuries. The mineral occurs here in a compact, much altered plagioclase augite rock described as a diabase, and in the adjoining volcanic ash beds of the Borrowdale series. It occurs near the junction of these rocks with an intrusive dyke, which has the appearance of a diorite. The decomposed feldspar, which forms the greater part of this rock, contains specks of graphite consisting of minute hexagonal plates. Strings of quartz also occur containing nests of graphite. The mineral appears to have occurred very irregularly in veins, beds and pockets. Large masses were met with at the intersection of the veins. It is not clear whether these masses are identical with the pockets or pipes, which were oval in section, sometimes measuring three yards in length by one yard in breadth, and were mixed with strings or bunches of quartz. They attained considerable depth, but began and ended suddenly. Infillings of graphite occurred in the joints in the neighborhood.

Analyses of some of the Borrowdale graphite gave from 78.10 to 91.55 per cent. of carbon, 1.10 to 6.10 per cent. of volatile matter, and 7.35 to 15.80 per cent. of ash, chiefly silica, alumina and iron. One analysis gave as high as 3.15 per cent. of titanium oxide.

*Condensed from an article in a recent Bulletin of the Imperial Institute.

Other occurrences of graphitie in a spotted slate of the Borrowdale volcanic series and in a granite quarry near Penryn, may be mentioned.

In Scotland graphite is found in many places, none of which has been continuously worked. At Craigman, in Ayrshire, a seam 3 to 6 feet thick is composed partly of graphite, "compact, scaly or columnar," and partly of glance coal. The coal has apparently been metamorphosed to graphite by intrusive sheets of greenstone, which now lie both above and below the seam. In Invernessshire, scaly or curved and foliated graphite is found in irregular masses in a micaceous gneiss, intersected by small veins of red granite.

Germany.—The only important workings in Germany are at Passau, in Bavaria. The graphite occurs in lenticular masses of highly-decomposed micaceous rock found in the hercynian gneiss, near the line of contact with the granitic rocks. The deposits are accompanied on the foot-wall side by beds of syenite and crystalline limestone, both of which contain a certain amount of graphite, and on the hanging wall by intrusions of gabbro. It is believed that the great earth movements that at an early period affected the district operated most strongly at the junction of the unequally-resisting gneiss and limestone, and that the syenite found its way along this line of weakness. The subsequent granitic intrusions were followed by emanations which decomposed the gneiss where it was crushed, and at the same time deposited the graphite. The gabbro was subsequently intruded, and from it was derived the pyrite which often accompanies the graphite.

Almost everywhere the presence of the graphite is marked by extreme decomposition of the rock, the original minerals and the structure being almost entirely destroyed. The deposition of the graphite seems to have been an accompaniment of this process. Everywhere it seems to have followed the lines of least resistance, being found in regions of crushing and portions of the rock rich in mica. The graphite occurs in large flakes, and is easily concentrated to 90 per cent. carbon by dry processes.

Austria.—The principal deposits of Austria are in Bohemia, in gneisses, granulites and mica schists, on the other side of the great granitic tract which adjoins the graphite region of Bavaria. Here also the crystalline limestone is met with in the neighborhood of the graphite. In the Bohemian beds pyrite is widely disseminated, an dweathers to a yellow ferruginous crust on the surface. The refined material does not contain more than 50 or 60 per cent. of graphite. In Styria, also, graphite is obtained. It occurs as beds or impregnations in chloritoid schists, alternating with true phyllites. It is remarkably free from pyrite, which occurs only in aggregates visble to the naked eye, and therefore easily removable. It occurs as a soft, earthy, lustreless variety, as "hard graphite," resembling anthracite, and in vesicular or coke-like forms. The vesicles in the third variety are filled with earthy graphite of great purity. Deposits of graphite, supposed to have resulted from the metamorphism of vegetable matter, are found in Moravia, where seams of graphite and of gneiss impregnated with graphite are intercalated in crystalline limestone. Metamorphism is attributed to intrusive sheets of basic rocks now represented by amphibolites.

Italy.—Graphite is worked in the north-west of Italy, where are deposits very similar to those of Styria.

Asiatic Russia.—There are numerous deposits of graphite in Siberia, but little work is being carried on. At a mine at Batugal, near Irkutsk, a thick vein of pure graphite appears to have traversed a granitic or dioritic rock. Large lumps of pure graphite are said to have occurred in the adjoining metamorphosed limestone.

India.—Graphite is found in many places in India. The most important deposits are in Travancore State, where it occurs in granulitic rocks of the charnockite series. In certain localities in the Central Provinces graphite is found in a series of garnet sillimanite rocks which overlie the granitoid gneiss. Graphite is also met with in Afghanistan and the Punjab, and it occurs in crystalline schists in the Kumaun district of the North-west Provinces.

Ceylon—From Ceylon the finest graphite is obtained. The mineral sometimes occurs in small scattered flakes in the granulites allied to the charnockite series of Southern India, and in the crystalline limestone. The deposits of commercial importance are, however, from beds, veins or nests in the granulite rocks and are undoubtedly of secondary formation. Large pockets containing many tons of pure flaky graphite alternate with narrow veins branching in all directions through the rock. The crystalline rocks are often altered at the surface, forming a coating of laterite that may be 15 to 18 feet in thickness, in which graphite of poor quality is still visible. By following this graphite down, material of the best quality may be discovered in the solid rock. The graphite has usually a flaky columnar structure, but occasionally large tabular crystals occur with a diameter of as much as 8 inches. A tendency to a radial formation causes the mineral to break up into three-cornered fragments. Sometimes it becomes so stringy as to be nearly asbestiform, or it may assume a compact finely-scaly structure.

The coarse prismatic structure usually occurs with a direction at right angles to the walls of the vein, while in the centre there is a secondary formation of compact mica. Where there has been movement along the vein the fibrous or flaky structure is drawn out more or less parallel to the walls, and in this way is often rendered compact. There is little alteration of the adjoining rock by the action of hot water and gases. Sometimes the adjoining rock is penetrated by scales and flakes of graphite, but not to a greater depth than about half an inch.

New South Wales.—Graphite occurs frequently in New South Wales, though little work is carried on. In Buller County, coal of the permocarboniferous period is converted into graphite by the neighborhood of an intrusive mass of granite. At a point 26 miles north of Walcha graphite occurs in a eurite dyke which is generally micropegmatitic and crowded with spheroidal segregations of graphitic material. The dyke is intrusive n a granite.

Victoria.—Fairly pure graphite, in small amount, is found in ordovician slates and graphitic slates.

Queensland.—Near Maryborough, bituminous coal of carbonaceous age is stated to have been metamorphosed by intrusive igneous rocks, mainly hornblende andisite. It has been converted on the west into graphite, on the east to semi-bituminous coal, anthracite and graphite.

New Zealand.—Considerable deposits of graphite occur at Pahawan Bay.

Canada is dealt with in another article in this issue.

United States—The deposits at Ticonderoga, Essex County, N.Y., occurring in a fissure vein in a garnetiferous gneiss, the foliation of which it cuts nearly at right angles, are the most important in the United States. Graphite is also met with in a grey quartzite, interbedded

with garnetiferous and micaceous gneiss. The rock contains about 10 per cent. of graphite, half of which is saved. The graphite of Newport, Rhode Island, appears to consist of coal of carboniferous age, metamorphosed into graphite.

MEXICO—At Sonora compact graphite is found where a coalfield of carbonaceous age has been much broken up by trap dykes.

SOUTH AMERICA.—Graphite is found in Brazil, where it is said to be formed by the alteration of carbonaceous beds.

REGARDING LEAD PENCILS

H. P. H. BRUMELL, BUCKINGHAM, QUE.

"Sir, I have been bold to note places with my black-leade."—Letter of John Evelyn, about 1650 A.D.

Why are lead pencils so called? In early German metal mining operations considerable quantities of a substance affording a grey-black streak or mark similar to that of metallic lead (in German, blei) were encountered, and it was assumed to be a variety of ore of that metal. To distinguish it, however, the new mineral was afterwards termed "wasserblei" (Molybdæna). In the graphite trade of the present day the German product is always styled German lead; that of Ceylon is known as plumbago, while the United States product is called graphite.

The making of lead pencils originated at the time of the discovery of graphite at Borrowdale, in England, in 1554. The name lead pencil was evolved through the confusion caused by the German misnomer "wasserblei," the material used being given the name of "reissblei" (drawing lead). To make matters ever more confusing, the makers of lead pencils called themselves "bleiweisschneiders" (white lead cutters).

In the early stages of the industry very crude methods obtained. According to Robt. Jameson, "Manual of Mineralogy," Edinburgh, 1821, "The finer kinds—(of graphite)—are first boiled in oil, and then cut into tables or pencils; the coarser parts, and the refuse of the sawings, are melted with sulphur, and then cast into coarse pencils for carpenters; they are easily distinguished by their sulphureous smell."

John L. Comstock, in "An Introduction to Mineralogy," Hartford, 1834, says: "The finer kinds of graphite are sawn into thin plates, one edge of which is then inserted into a groove, in a small semi-cylinder of cedar wood, which is then sawn off in a line with the wood, and the other half glued on. In this manner the common black lead pencils are made."

As may be seen, the early method of manufacture was most wasteful. In 1795 Coute, a Frenchman, conceived the idea of pulverizing the graphite and mixing it with a binding clay. This mixture, when baked, was used in the old way and afforded a much more uniform product, and by reason of the clay admixture, he was enabled to produce pencils of varying degrees of hardness. With modifications, and the vast improvements brought about by modern machinery, this method is still employed in the making of graphite lead pencils.

Figures are not at hand relating to the extent of the pencil industry, but it is well known that enormous numbers are produced annually in Great Britain, the United States and Germany, smaller quantities being produced in France and Austria. In the United States, according to the Forest Service Bureau of that country, about 320,000,000 are produced annually. To this may be added about the same number for Great Britain and about five times as many for Germany and Austria. For the manufacture of those produced in the United States, 7,300,000 cubic feet, or 110,000 tons of wood are used, nearly all of which is red cedar.

Toward the conservation and economic use of commercial woods, the Forest Service Bureau has made a careful study of red cedar, and recommends several changes in present forest management in order to secure the desired growth. In the Southern forests the cedar will have to be given a better chance, instead of being considered, as now, a negligible quantity in its younger stages, and many of the forest-grown trees, which are now cut for fence posts, can profitably be left to attain their full development, and thus become available for pencil wood.

It is doubtful if any other wood-using industry is so dependent upon a single species as the pencil industry is dependent on red cedar. In fact, red cedar suitable for pencil manufacture is the only wood the price of which is always quoted by the pound.

No graphite pencils or crayons are, as yet, produced in Canada, the market of which is supplied principally by Great Britain, United States, and Germany. The imports for the past twelve years were as follows:

1895	$57,911	1901	$104,455
1896	62,598	1902	105,662
1897	71,211	1903	125,036
1898	73,002	1904	153,598
1899	80,474	1905	172,871
1900	98,832	1906	175,747

PROSPECTING IN UNGAVA

(Continued from page 48.)

For our dog-sledge (komitik) trip to the south we engaged two dog teams and komitiks besides our own. Although March was more than half over, the weather was still severe. We were equipped with a sheet-iron stove, a light canvas tent, deer-skin sleeping bags, and heavy deer-skin clothing. Ample quantities of provisions were taken along and cached on Gillies' Island.

Most of our travelling was done on the snow-covered ice between the islands and the mainland, although several times we were forced on account of loose ice, to travel inland over very broken country. It is then that the Eskimo displays his skill as a teamster. He leads his dogs with the nicest precision over bad ground, skirts the difficult hills, prevent his komitik from bumping over hummocks, and in all exercises wonderful judgment and resourcefulness. He further develops a marvellous degree of cleverness in handling the long Eskimo whip—a deadly weapon, consisting of a short handle of wood or of heavy hide, with a long lash, ten to fifteen feet in length, made of interwoven thongs of rawhide. With this whip the Eskimo can flick a tuft of hair and skin off any recalcitrant member of his team. In the hands of a novice, however, it is suicidal.

About eight days' travelling brought us to Gillies' Island. Three nights we had slept in snow houses. For fuel we had to depend upon driftwood, which we dug up on the island shores. When we found driftwood we cooked our meals on our camp stove and pitched our tent. When no wood was discoverable, we slept in snow houses and dined on biscuits, stick chocolate and deer's fat. Our day's run rarely exceeded twenty-five miles. In stormy weather (and the snow storms of Ungava are not pre-eminently pleasant) we were content when we had covered much less ground. After early breakfast,

the komitiks were hastily loaded, securely thonged, the dogs were harnessed up, and we walked and ran alongside the teams until noon. A breathing spell of a few minutes was then allowed. Sometimes, not very frequently, we brewed a hot pot of tea. Oftener we simply munched our cholocate and biscuits. Usually we allowed a good hour of daylight for pitching our tent or building snow houses. One of our Eskimos took occasional trips after seals for dog feed. The dogs were fed but once a day. During work hours they behaved themselves, indulging only in mild squabbling. All real differences or disputes were settled in the evening, and many were the wounded animals that we had to mend. The leader of each team pulled on a long centre trace. The rest of the team were arranged like the sticks of a fan on either side of the leader, with gradually shortening traces. When a dog misbehaved himself his trace was shortened and the whip was brought into requisition. For the leader it was usually sufficient to shorten his trace.

When we reached Gillies' Island, where our surveying was to be commenced, the ice began to show signs of softening. We managed, however, to complete our work there, although we moved our camp to the mainland opposite. In marking out our claims we used posts hewn from driftwood, clearing away the snow at the claim corners as well as could be, and securing the posts with loose pieces of shale. Before April 1st we finished the location of claims on Gillies' Island, and made a traverse of its shores. In all this work we used two of our Eskimos as chainmen, etc. They proved reliable and intelligent and exceptionally quick. By April 6th we had finished location work on Taylor Island, and had traversed to Nastapoka Falls. A winter view of these glorious falls is compensation for any amount of hardship.

We reached Port Harrison, our winter quarters, on April 11th. A very marked difference in weather was now observable. Although we had encountered a few days of soft weather near Gillies' Island and at Nastapoka Falls, at Port Harrison, winter was still supreme. However, the northern sun had done strange things with our complexions. Our first view of ourselves in a looking glass was a surprise. Our faces were tanned to a rich mahogany color, and our beards bleached to a straw shade.

Late in April the other two white members of our party, who had taken a trip up north, got back to headquarters. The laboratory was once again put into commission, and a series of gold and silver assays and various wet determinations were made. Plans and maps were prepared, and photographs developed. During May snow fell to such an extent as to exclude light altogether from the north side of our dwelling. On May 29th a snow storm of unusual severity completely blockaded us. Not until the first week of June did any approach to a thaw set in. On June 6th the last snow house (igloo), in which one of our Eskimo friends had been living, went out of commission.

The evenings were at this season so long that one could read ordinary print until 10 p.m. without artificial light. Towards the middle of June we began scraping, repairing and painting our yacht and sail-boats. The Innuksuak River (on the north bank of which were our winter quarters) did not clear itself of ice until June 28.

On Tuesday, July 8, three of us, with one Eskimo, sailed north, intending to spend a few days in cruising. With much difficulty we made our way through ice and fog for about twenty miles north of the Innuksuak River. One night, when we had both anchors out, a field of ice drifted down on us. Both anchors were lost, and we escaped with our lives by the sheerest luck. After drifting about in the fog for many hours, we ran into a snug little harbor, where we moored the yacht. The Eskimo and Mr. Young were then despatched in our small tender to get assistance. In three days' time they came back with grappling irons and other necessities. We succeeded in recovering both anchors and hurried back to Port Harrison on July 22nd.

It only remained for us now to destroy whatever dangerous chemicals were left, to dismantle the laboratory, and to pack up as many of our belongings as we could take in the yacht. We had seriously thought of cruising out to the mysterious Belcher Islands; but the ice absolutely forbade this.

Our final "good-bye" was said to our Eskimo friends at Port Harrison on July 26. Violent rain and sleet storms drove the ice into Hopewell Sound and we were held at Leonard Island (one of the most southerly of the Hopewell Islands) until August 9th. Not until a week later did we reach Nastapoka River. Thrice we were forced to beach the yacht to save her, and we had several hairbreadth escapes from being jammed to pieces. By August 23rd all survey work left over from the spring was finished, and we headed for our long run to Moose Factory. After one or two mishaps we made Little Whale River August 30th. Here we stopped three days for repairs.

With the first symptom of warm weather the mosquitoes had appeared in clouds. We dreaded the necessity of landing on a fair day on account of these pests.

September 12 saw us in the mouth of Big River, within sight of Fort George. After enjoying the warm hospitality of this Hudson Bay post, we started south again. We reached Charlton Island without mishap. The second of three beautiful Husky dogs, which we had picked up a few weeks before, died here. Another had been lost at Fort George. The third, a magnificent iron grey fellow, came safely through to Ottawa.

A successful run to Moose Factory, and all but the last stage of our journey was over. After dismantling the yacht we hired a large canvas canoe, and, with a crew of six Indians, we started up the river. It took fourteen days of hard paddling to bring us to Missinabie, on the C. P. R. Our voyage up was without incident. We arrived in Ottawa in the second week of October, 1902, after an absence of eighteen months.

. . . . . .

That the vast deposits of iron ore between latitudes 56° and 58° will some day become valuable is certain. How long a period may elapse before it becomes practicable to develop them by means of the enormous water-powers within a few miles of their best sections will depend upon the gradual perfecting of electrometallurgical processes. There will also be problems of navigation to be met. But the establishment of rail connections at a Hudson Bay harbor and of a Hudson Bay-Atlantic steamship route, will indirectly throw a great deal of light upon all the latent possibilities of the Ungava shore.

Bulletin No. 1 of the Geological Survey of New Zealand mentions an important occurrence of platinum in the Hokitika District. Two localities are cited. At the first of these, Hailey's Creek, the white platiniferous quartz occurs in lenticular veins intercalated with the country rock, which consists of a dark shaly phyllite. Assays yielded from 3 dwts. 8 grs. to 1 dwt. 2 grs. of platinum and of silver from 1 oz. 4 dwts. to 7 dwts. per ton.

Report of the Nova Scotia Department of Mines for the Year Ended 30th September, 1906

The facts adduced from this report prove that Nova Scotia has, in the main, made due progress in developing her mineral resources.

Gold production has fallen off. The actual decrease is 504 ounces. The figures given for iron ore are of doubtful value. If the amount of iron ore imported be correctly given, it leaves but 1,064 tons to the credit of local mines—an obvious error. The coal output for 1906 exceeds that for 1905 by 636,185 tons, and the amount of soke made in the latter year is greater by 140,304 tons than the total for 1905. Gypsum and limestone show a notable increase. Copper ore re-appears upon the list. The table given herewith furnishes the figures of output for the years 1905 and 1906.

		Year ended Sept. 30, 1905.	Year ended Sept. 30, 1906.
Gold	Oz.	15,550	15,046
Iron ore [1]	Tons	73,600	648,042
Manganese ore [2]	"	22	1½
Coal raised [2]	"	5,050,420	5,866,605
Coke made [3]	"	367,778	508,082
Gypsum [3]	"	197,292	247,840
Limestone	"	274,002	400,584
Barytes [3]	"	4,500	3,500
Moulding sand [2]	"	230	1,460
Copper ore [4]	"	...	190

The total revenue of the Mines Department attained the very respectable amount of $643,457.77. Of this the item of coal royalty contributed $575,065.89. A sum of $64,954.57 was paid out in bonuses on each ton of coal consumed in the manufacture of iron and steel in Nova Scotia.

COAL TRADE.

The returns of coal sold during the year 1906 show 5,194,590 tons, as compared with 4,475,284 tons in 1905. Shipments to other Provinces and to the United States have very materially increased. Quebec took 1,739,308 tons, an increase of 246,909 tons in 1905. The amount consumed in Nova Scotia also displays a large increase. The Province took 1,962,206 tons in 1906, as against 1,651,735 tons in 1905.

The following figures give the coal production to counties:

	Total Coal Raised.
Cumberland County	638,728 tons
Pictou County	670,436 "
Cape Breton County	4,318,944 "
Other Counties	238,937 "

It is interesting to note that the Intercolonial Railway purchased 420,269¾ tons of round coal, 12,261 tons run of mine, and 5,099¾ tons of slack. Fifteen companies contributed to this total. Eight of these companies filled contracts for amounts greater than 20,000 tons. The Cumberland Railway & Coal Co. supplied the largest tonnage of round coal to the railway, 85,792½ tons. The Dominion Coal Co. came next with 63,414¾ tons. The Intercolonial supplied 60,141 tons. These, with the Acadia Coal Company, the Maritime Coal & Railway Co., and the Inverness Railway & Coal Co., were the largest contractors with the railroad.

Among the operating companies the Dominion Coal is by far the largest producer, its output being 3,603,985 tons. The Nova Scotia Steel and Coal comes next, with 665,033 tons; Cumberland Railway and Coal ,484,816; Acadia Coal Co., 329,641; Intercolonial Coal Co., 303,426 tons; Inverness Railway and Coal Co., 207,842 tons; Canada Coal and Railway Co., 50,688 tons. None of the remaining collieries exceeds 50,000 tons. 12,123 persons are employed in the coal mining industry.

GOLD MINING.

The total gold production for 1906 is given variously as 15,046 ounces and 13,048 ounces. We believe the former to be the correct figure.

GUYSBORO COUNTY.—In Guysboro County six companies are reported as actively engaged in mining and milling. At Isaac's Harbor the *Boston Richardson Mining Company*, employing 126 men, in two 10-hour shifts extracted 4,819 ounces of gold ($91,561) during 1906, from 35,220 tons of quartz, an average of $2.60 per ton. Instead of timber coverings for the levels, a rib 20 to 30 feet high is left over the levels, chute holes being left at intervals of 50 feet. This system is copied from the Treadwell. The Bromo-cyanide plant has given an average extraction of about 70 per cent. on concenrates carrying from $15 to $20 per ton, at a very low cost. A higher percentage extraction, it is claimed, could have been obtained, but the cost per ton would have been prohibitive. An abstract of the monthly statement for August, 1906, is here reproduced. It will repay examination:

No. of tons crushed	3,839 tons
No. of tons concentrated produced	82.72 tons
Value of ore per ton (assay)	$2 94
Value of concentrates per ton	17 00
Total value recovered	2 55
Cost of operation of mine, per ton	1 08
Cost of operation of mill, per ton	0 19
Cost of operation of cyaniding plant, per ton	0 10
Cost of cyaniding concentrates per ton concentrate	4 39
General maintenance of plant per ton of ore	0 53
Total cost of operation per ton of ore	1 90
Average crushing per stamp per 24 hours	2.98 tons

We consider these figures noteworthy. Here is a plant, treating ore averaging $2.94 per ton, at a nominal net profit of $1.04 per ton. The percentage of concentrates is low, and they carry only light values. The figures reported imply careful management and strict attention to detail. We are glad to notice that 40 stamps are to be added to this mine's equipment. The *Beaver Hat Gold Mining Company*, Lower Seal Harbor, under the management of Mr. S. Clifford MacLean, has been occupied largely in development work. The Seal Harbor Mining Company, soon to be operated anew, ceased work in 1906. The whole plant is to be run by electricity. The *Wine Harbor Mining Company*, managed by Mr. J. Owen James, employs about 40 men. From the 300-foot level comes most of the ore shipped. *California Gold Mining Company*, Cochran Hill, until recently under the management of Mr. G. F. McNaughton, has workings to the depth of 225 feet. All timbering is done by the square sett system.

[1] Iron ore imported, 646,978 tons.
[2] Ton of 2,240 lbs.
[3] Net tons.
[4] Amount exported.

Halifax County.—*The Ecum Secum Gold Fields, Limited,* operates 10 stamps of a 20-stamp mill. The mine was unwatered in August, 1906. The *Harrigan Cove Gold Mining Company,* Mr. Munroe Archibald, manager, has done a total of 470 feet in drifting. It has leased the St. Anthony Gold Mining Company's areas to the north. The Dominion Mining Company (formerly the Boston Tangier Company) have deepened their shaft to 202 feet. The *Dixon Mine,* Cariboo, is being worked on a small scale. On the Baltimore & Nova Scotia Mining Company's property (Cariboo District) nothing has been done beyond keeping the water below the 700-foot level . At Moose River the G. & K. Comapny are open-cutting the slate belt on Area 77. The property of the old Touquay Gold Mining Company is to be reopened. The Oldham Stirling Gold Company, at Oldham, employs 30 men. During the year the inclined shaft was carried to the depth of 969 feet, 129 feet being sunk during 12 months. New levels are driven at shaft bottom. All work here is done by underhand stoping. This is one of the very few Nova Scotia mines where this method of winning ore continues in use. The lead to the deep holds its size and the dip is 40 degrees, as compared with 38 degrees at 800 feet from the surface. Crushing in the Taylor mill, on an adjacent property, yielded two ounces to the ton. Two trials in the company's new mill resulted in a loss of fully one ounce to the ton. No reason is assigned for this remarkably poor work.

Lunenberg County.—The most important gold mining in this county was carried on by the Micmac Mining Company at Leipsigate. Sixty men are here employed in double shift. About 3,600 feet of levels have been driven during 1906. It is planned to operate the whole plant by electric power, brought from the town of Liverpool, 20 miles distant. As the mine is wet and fuel very expensive on account of the distance from tidewater and railway, this will be a very pronounced improvement.

AURIFEROUS ANTIMONY.

The Dominion Antimony Company, West Gore, Hants County, shipped a total of 782 tons of ore during 1906, yielding 1,031 ounces of gold ($19,589). Forty men were employed in two 10-hour shifts.

IRON ORE.

At Torbrook, Annapolis County, several mines operated by the Londonderry Iron & Milling Company produced about 27,000 tons of iron ore. The iron ore mined at Londonderry and Brookfield, Colchester County, is not mentioned in the report. The Londonderry output alone must have aggregated over 70,000 tons.

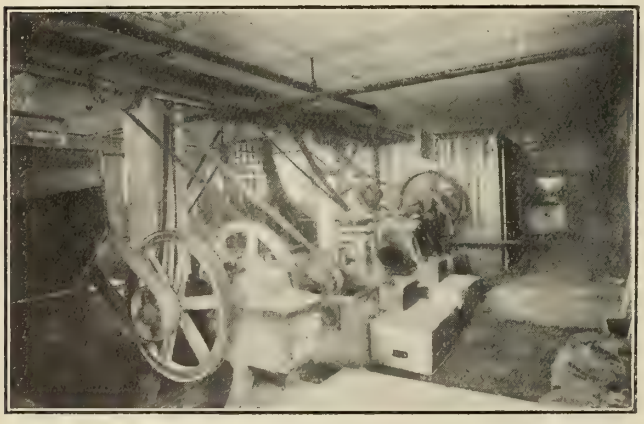
GOVERNMENT DRILLS.

The Provincial Government places three Diamond drills and four Calyx at the disposal of mine owners. During 1906 a total of 2,839 feet 9 inches were bored in carrying on prospecting. The cost per foot averaged from $2.66 for a 566-foot hole mostly in shale conglomerate and sandstone, with a Calyx steam drill, to 50c per foot for a 696-foot hole using a Diamond steam drill. The high cost of the first mentioned boring was due in part to delays in getting supplies.

The Mining Laboratory of Dalhousie University, Halifax, N.S.

By Frederick H. Sexton, S.B.

During the last four years, Dalhousie University, in Halifax, N.S., has established a faculty of engineering containing two departments, civil and mining engineering. The courses are now well organized and running smoothly, and a short history of the installation of the mining laboratory, setting forth some of the difficulties overcome, may be of interest to more than have actually been called upon to equip an up-to-date laboratory with an old-fashioned sum of money.



ORE CRUSHERS



STAMP MILL, SHOWING MOTOR DRIVE

The first step was to install apparatus for conducting work in fire assaying. It fortunately occurred that the Halifax Electric Tramway Co. were tearing down the by-product coke ovens of the plant formerly belonging to the People's Heat and Light Co. The Tramway Co. generously furnished the Mining Department all the second-hand fire brick it wished, for a price about half that of a good grade of common red brick. Enough good sound fire bricks were secured for pot, muffle and reverberatory furnaces. Fortunately, also, one of the mining students was an expert mason, used to handling fire brick, and he laid all the fire brick during spare hours.

The pot furnaces are made up of shells of ¼ in. boiler plate, with a door in the lower part of the front, and a draught hole in the upper part of the back. They are

lined with one course of fire brick laid stretcherwise inside. The grate is composed of loose bars of ¾ in. square wrought iron, supported by two 1 in. square wrought iron bars let into the brick work. The grate bars could be pulled out through the door. The furnaces are 15 in. square inside and 2 ft. 8 in. high. The cover is a 2 in. fire brick tile, bound with wrought iron and counterweighted so that it can be easily slid back to open the furnace. The total cost of each furnace to the college was $23.60, of which $21.15 was the cost of the shell obtained from local dealers.

The muffle furnaces are built in the same manner, i.e., a ¼ in. boiler plate shell lined with one thickness of fire brick laid stretcherwise. The furnace is 23 in. square inside, 4 ft. high, and contains an L Battersea muffle. There is a charging door for the coke above the muffle, a stoking door and an ash pit door at the very bottom. The fuel used is coke. The grate bars are the same as in the pot furnaces only of larger dimensions. The cost of a muffle furnace to the college was $48.20, of which the shell alone cost $44.50.

The pot and muffle furnaces have required nothing for repairs for three years except two sets of grate bars, two new baffle plates, and of course new muffles, and they have been in almost constant use during that time.

Later a gasoline muffle furnace was obtained from sums of money paid to the laboratory by people who come to work in it, and has proven most useful for muffle fusions and cupelling. With coke at $5 per ton and gasoline at 26c per gallon, it costs about two and a half times as much to run the gasoline muffle as the coke muffle, the latter being a trifle the smaller.

The working desks for assaying provide room for twelve students and were made for a reasonable sum by a local carpenter.

The next work attempted by the author and his students was the construction of a reverberatory roasting furnace. This has a hearth of 10 square feet area and a grate of 4½ square ft. area. The large ratio between the two areas is necessitated by its diminutive size. The hearth is composed of three large 4 in. tiles of fire clay, which give a very smooth surface with very few joints. There are three air entrances from the fire bridge directly to the hearth, through which fresh air is supplied to the roasting ore. An adjustable shutter regulates this air supply.

A small reverberatory furnace of the style of the English cupellation furnace, with removable test, is contemplated at present for the refining of copper and for cupellation of base bullion.

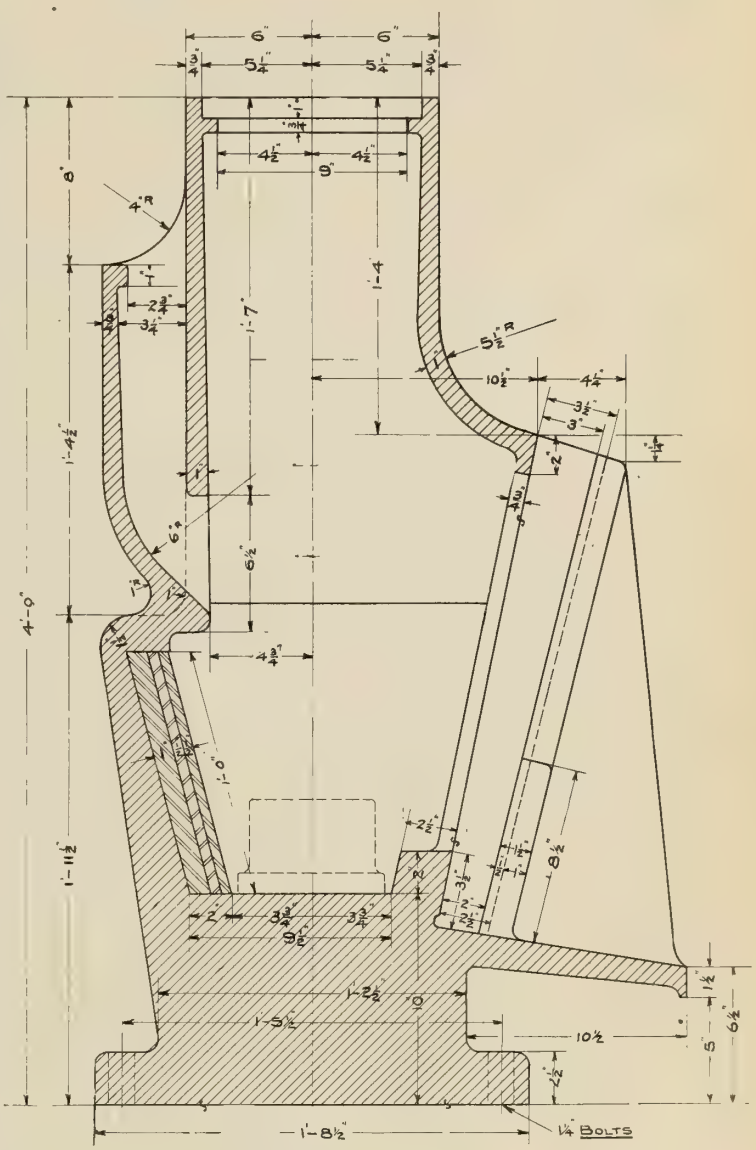
In the main mining laboratory is a single line of shafting running lengthwise, which is driven by a 10 h.p. 220 V., 3-phase induction motor, and which drives all the machinery except the stamp mill. All of the machines are set upon concrete foundations.

The crushing is done by three small laboratory crushers and a small pair of Cornish rolls. The coarse breaking is done by a 4 in. x 6 in. Blake-Marsden breaker, which will crush to 2 in., 1½ in., or 1 in., as desired. The intermediate crushing is performed by a small Gates spindle breaker built especially for laboratory work, which will take ore up to 2 in. diameter and reduce it to ¼ in. to ½ in. size. The finer work is done by a Gates fine grinder, which will grind ore of ¼ in. to ⅜ in. through a sieve of 80 meshes to the linear inch. These three machines are placed side by side, and with their aid a sample may be very quickly prepared for assay.

A sampling floor 10 ft. square, of concrete with a neat cement top finish, has been found to be very satisfactory.

The Cornish rolls were manufactured by the Jenckes Machine Co., of Sherbrooke, Quebec. The rolls are 8 in. face and 12 in. diameter, with manganese steel shells. They have not yet been provided with an automatic feeder, but will be in the near future. They are also set on a solid concrete foundation.

All screening is done in a flat shaking screen. This consists of a flat frame supported by light chains, shaken by an adjustable eccentric, which contains any one of a series of light frames 3 ft. 6 in. by 14 in., with different sizes of wire attached to them. This



CROSS SECTION OF MORTAR

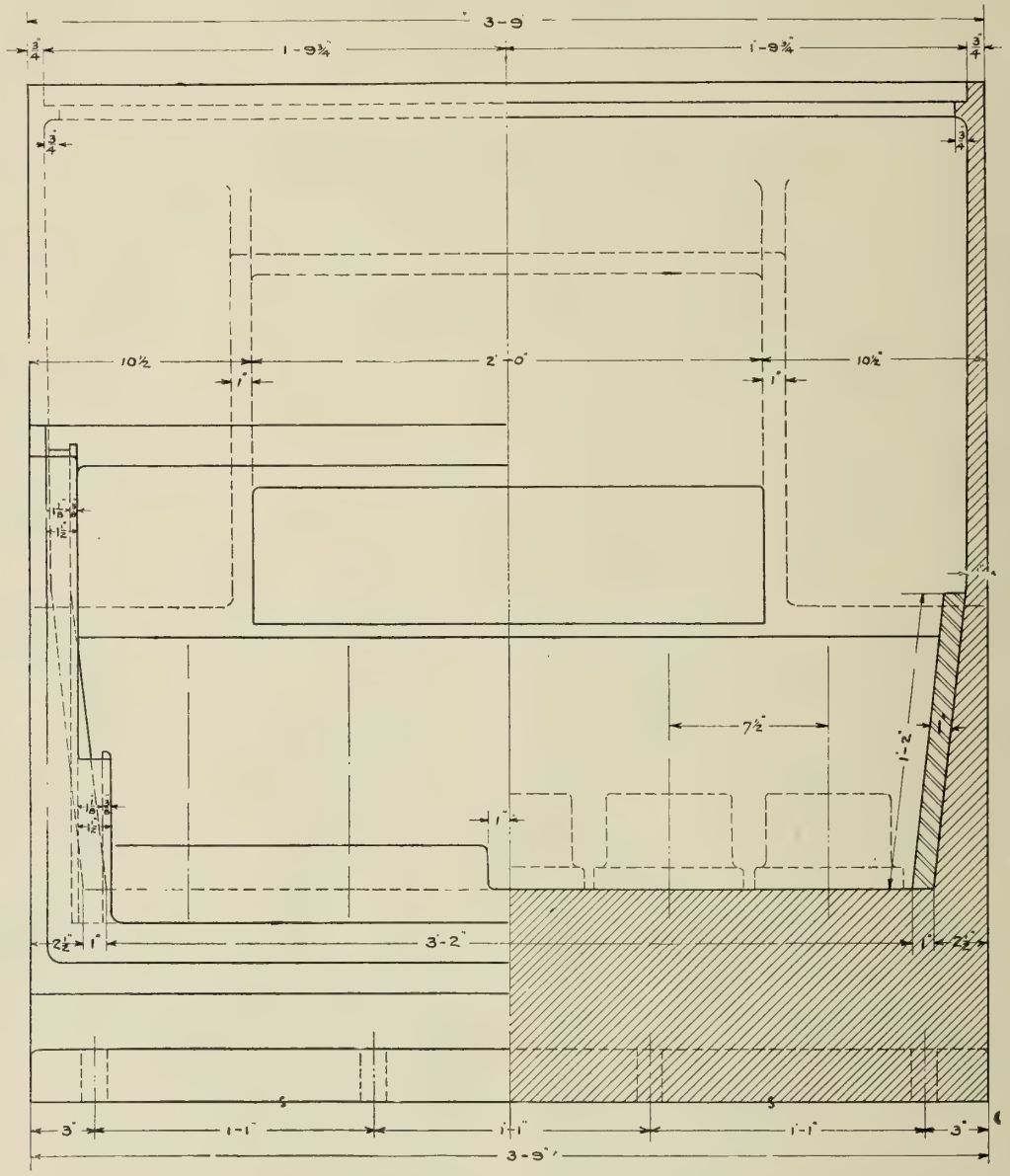
screen is enclosed in a dust-proof casing. It is light enough to be moved from the rolls to the other crushers when needed.

The Mining Department was presented with a vertical duplex air compressor by the Canadian Rand Drill Co., with a capacity of 80 to 90 cubic feet of air per minute. This furnishes us with compressed air for all purposes.

The only machine for concentrating coarse sizes of ore at present is a two-plunger Collom jig presented to the laboratory by the Mining Department of the Massachusetts Institute of Technology. It is fitted with a very complete set of sieves, and serves its purpose very admirably.

A small gold clean-up barrel also constitutes a part of the equipment of the laboratory. This was secured from a gold mining company operating in the Province, for whom it had proved too small, at junk price. It serves many purposes. It fulfills its proper role as a clean-up barrel; it is also used as a tube mill, and serves as a machine in which to carry on slime agitation tests.

The laboratory also is possessed of some simple home-made classifiers. These are made by screwing into a cross-fitting of unequal dimensioned arms a short piece of pipe in the largest orifice for a sorting column. The two orifices at right angles to this piece of pipe would be such that their combined area was one and a half to twice as large as the cross-section of the first piece and by the proper piping the hydraulic water is fed into these two orifices, so that one-half of the hydraulic water meets the other half squarely, and rises with it in the sorting column. If the water is introduced at one side only in the sorting column, it gives rise to eddys and inversion currents that derange the work of the classifier. To the remaining orifice is screwed a reducing connection, into which is driven a wooden plug with the proper sized hole in it to serve as a spigot discharge. To the top of this lower sorting column of hydraulic galvanized pipe is soldered a rectangular box of proper cross-section to serve as an upper sorting column. This box has a slot near the bottom, into which the pulp is fed through a compartment soldered on the back as high as the box. The overflow escapes through a slot with an outward lip situated near the top of the box on the side opposite the feed. These classifiers are very easily and cheaply made, and have given good satisfaction for many kinds of work, from washing the sulphur from coal to classifying coarse, heavily sulphuretted ores.



MORTAR ELEVATION

For concentrating fine ores the Mining Department has a half-size Canadian Wilfley Table, manufactured expressly for the laboratory and presented by the Truro Foundry Company. The wash water can be regulated for every 18 in. in length of the table, thus supplying water on the table exactly as it is needed.

More effort was expended in designing and installing the stamp mill than in any other way. It was felt that the small three-stamp prospecting mill that is used in

so many mining laboratories did not duplicate well enough the actual operation of the common five-stamp mill. It was also felt that the actual full size mill required too much cost and labor in providing it with enough ore if run frequently, and that such a mill was not flexible enough in its adjustments to illustrate different milling practices.

Since the basement in which the mining machinery is installed is only nine feet high, it became necessary to excavate a hole large enough to sink it below the floor level. Therefore a rectangular hole 17 ft. wide and 32 ft. long was dug to a depth of nine feet and lined with a wall of concrete (1:9) 8 in. thick at the top and 18 in. thick at the bottom. The ground excavated was an extremely hard blue clay, so hard near the bottom that a pick could hardly be driven into it. The ground was also very wet, and a feeder was found near one corner of the pit that attained the proportions of 10 gallons per minute at one time, and had to be pumped night and day. To make the pit water-tight, plates of galvanized iron covered with tar were placed in the centre of the walls and bottom, the ends of the plates overlapping one another. There was such a constant inflow, however, that small channels were formed through the setting cement, so that the walls when finished were not absolutely water-tight. The amount of water seeping in now for a week is so small that it can be pumped up in five minutes.

The excavation of this pit and the settling tanks and the mixing of the concrete was performed by laborers, and this was the only work outside of the pipe fitting and part of the carpenter work of fitting the battery frame that was not performed by the author assisted by the students. All the machinery, battery, frame, mortar, etc., was moved into place even without the aid of block and tackle. A great deal of time and effort was required to get the battery frame in place, because there was only a clearance of two inches between the top of the post and the ceiling, and the timbers were heavy. The sills are 12 x 16 inches, the posts 12 x 14, and the back struts 12 x 12 inches unbled Georgia pine.

Following is a description of the installation of the stamp mill abstracted from a paper read by the author before the Mining Society of Nova Scotia on March 9, 1905:

"The stamp mill was designed with two chief ends in view. The first was to provide a wide range of adjustment in order to illustrate to the students the various practices of gold milling, and the other was to make the machine, as far as possible, suitable for testing any of the local ores for the best milling conditions for that particular ore. Thus the students could arrange the mill to have a high drop, high discharge, small number of drops and wide mortar, and carry out Colorado practice aiming at extracion principally by internal amalgamation. On the other hand, they could vary the same adjustments to turn the stamp mill into a machine running in the way of those in South Africa, where the principal aim is capacity and incidental amalgamation. In this way the flexibility and adaptability of the stamp mill is firmly impressed on the students' minds, and the adjustments become real live things that are bound to stay with him, instead of mere book statements that are so likely to fade quickly from his mind if he is not compelled to make practical use of them in after life. It was thought that this mill would be invaluable to an engineer in developing a new property, by giving him a chance to thoroughly test his ore and be sure of no mistake in designing his permanent mill.

"The mortar block was built of concrete set on bed rock. The rock used was a hard, fine quartzite, locally known as 'whin.' This was purchased in the form of small boulders, and crushed in the laboratory 4 in. x 6 in. Marsden-Blake crusher to 2 in. The run of crusher was used because it contained very few fines. The quartzite broke in very sharp angular fragments, and was a most excellent product for concrete. At the bottom the proportions were:

Broken stone (2 in.—0)	5¼ parts.
Sharp sea sand	1¾ "
Portland cement	1 "

"The proportion of cement was increased toward the top. The top was composed of:

Broken stone (⅜ in.—⅛ in)	1 part.
Sharp sand	½ "
Portland cement	1 "

"Usually the top of the mortar block consists of a soft grout poured in after the mortar has been set in place on the anchor bolts. Where this has been done, in some cases that have come to my notice, the foot of the anvil block has cut into the grout, and the mortar has been thrown out of line. The use of part fine broken rock instead of pure sand in the top flushing gives a material that is better able to stand the abrasive jar of the anvil, to which it is subjected.

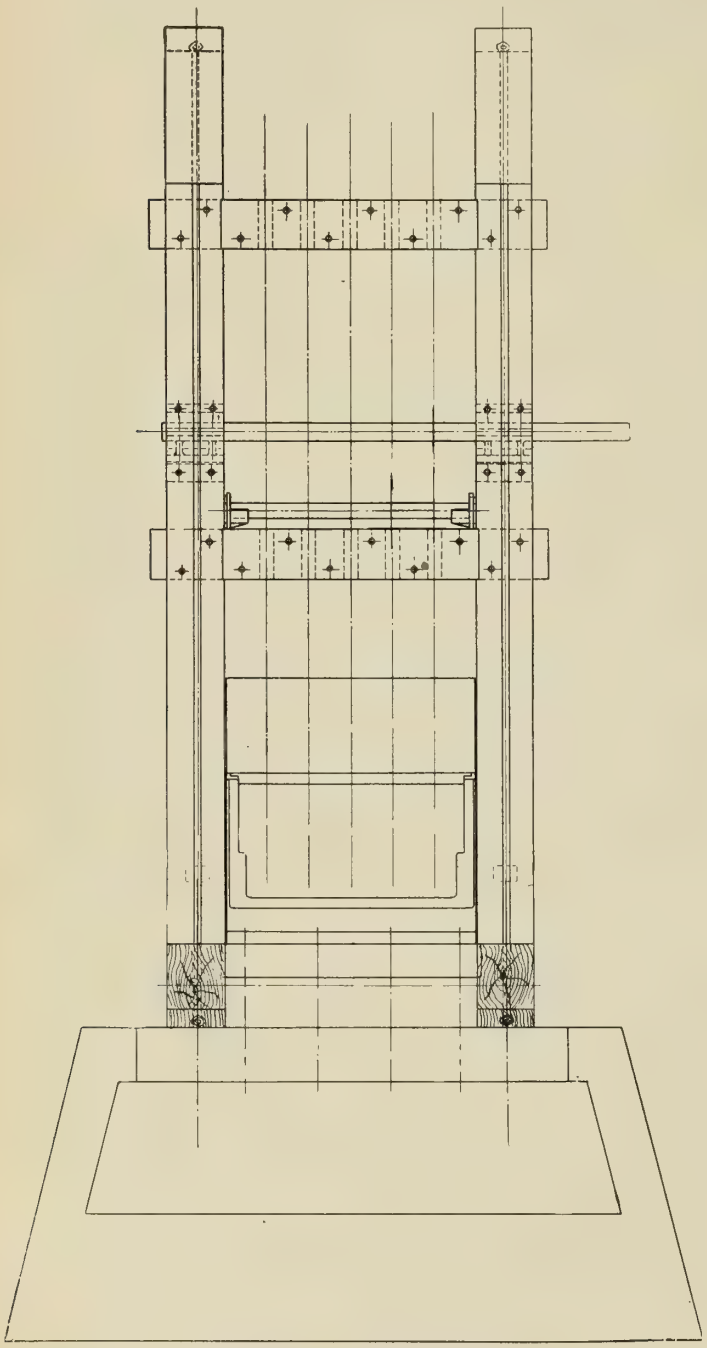
"On top of the concrete block was placed a piece of 5 in. unbled hard pine, thoroughly covered with tar. In regular modern installations it seems a general practice to place a piece of ¼ in. pure rubber between the concrete and the anvil block. The aim in this small mill was to dispense with the anvil block by casting a mortar with a very thick bottom, and to obtain the combined resiliency of rubber and anvil in the thin layer of hardwood. In this laboratory mill there was no call for great capacity, so that it did not need to be rigidly connected to the concrete. The anchor bolts were placed in pieces of 2 in. pipe which were filled in with 1:1 grout when the mortar was lined up and levelled. The nuts on the anchor bolts needed considerable tightening after the first run or two of the mill, but have not shown any sign of loosening since.

"The mortar which is shown in cross-section and elevation in the figures undoubtedly looks very grotesque to the experienced millman. It is exceedingly high and narrow and has an ill-favored looking hunch on the back which destroys the symmetry of the casting. The unusual height is to allow of a very high drop, and the hunch on the back is caused by a recess back of the dies filled with liner plates, which may be removed one by one to give greater width to the mortar when the rest of the adjustments are arranged to allow greater facility for internal battery amalgamation. As these back liner plates are removed, it leaves the dies relatively nearer the screen and in front of the axis of symmetry of the modified shape of the lower half of the mortar. This arrangement has proven most efficacious in reducing the swash of pulp in the mortar and offering a safe hiding place for the gold amalgam where it is little abraded. This same modification of placing the dies ahead of the centre line of the mortar was employed with great success by a local mine manager for the almost complete recovery by amalgamation of the values from a gold ore running about $200 to the ton, where the gold was so fine it could hardly be seen with the naked eye. When all the liner plates are in place, the mortar has a very narrow shape adapted for fast crushing.

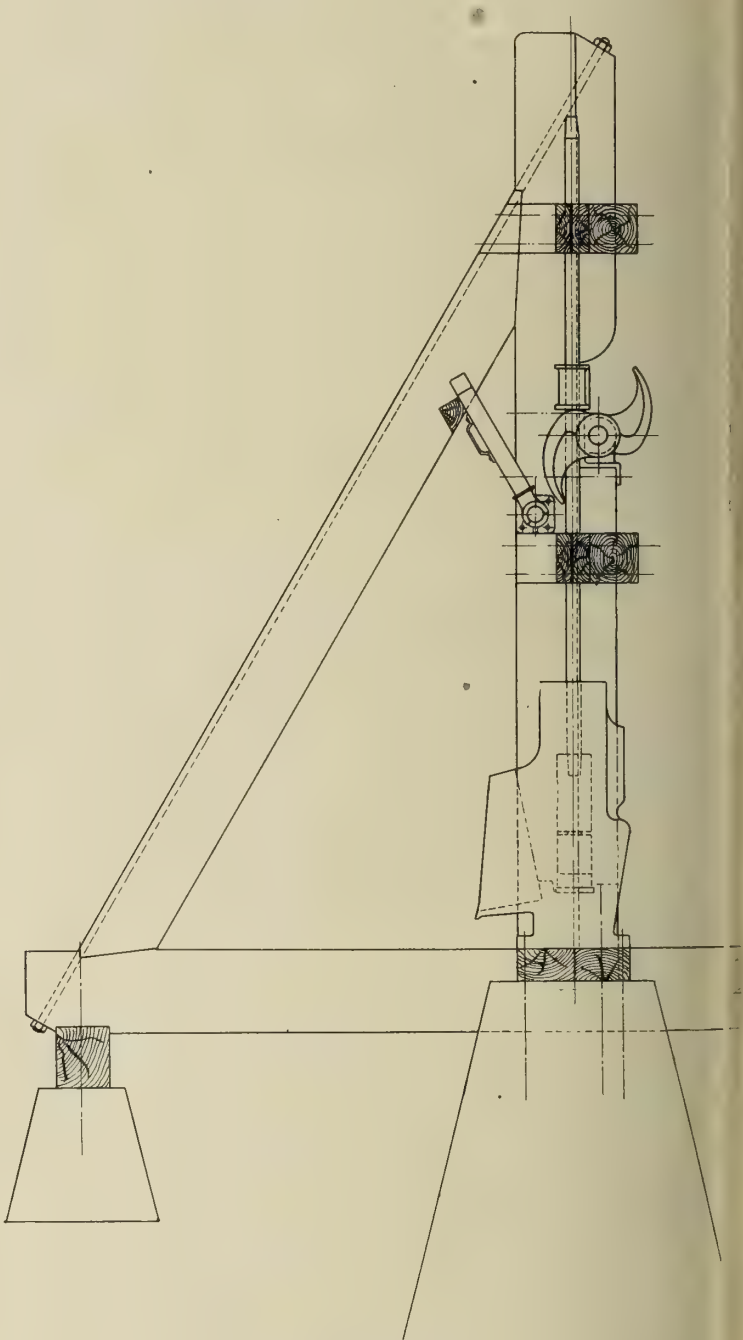
"The mortar is provided with a low lip of 2 in. in the front within a slot of 2 in. cut in the centre of

it, through which a bar may be placed to lift the middle die first, in a clean up, and through which the last of the battery sands may be flushed out. It is common practice in Nova Scotia to use flush-bottom mortars without any front lip at all, but it would seem that these offer a good chance for the die to twist or overturn in running, although millmen claim this accident is of very rare occurrence. The bottom of the mortar is cast thick

"One inside amalgamated plate is attached to a curved chuck block just below the screen frame. There is provision for attaching a back amalgamated copper plate to the back of the mortar or to one of the back liner plates when using a wide mortar. The water is fed through the front under the screens in six jets through $\frac{1}{8}$ in. pipe, between each pair of dies and at each end. The ends of the pipes inside the mortar are set about $\frac{3}{4}$ in.



Front View Battery Frame Timbers of Stamp Mill.



Side Elevation of Stamp Mill.

to compensate for the lack of any anvil below it and for its comparatively rigid connection to the concrete mortar block. The front of the mortar is held in by four keys, a pair of long ones and a pair of short ones. With this arrangement, the front can be made in two sections and the upper half taken out to remove pieces of wood, iron, etc., or to replace a loose shoe; while the lower half, which retains the sand to the level of the top of the dies, is undisturbed.

below the level of the dies, and have an inclination up toward the top of the dies. These jets serve to keep the sand loose and offer a good hiding place for bits of hard amalgam. This is well shown in the clean up, for when the front is taken off a large bunch of bright, hard amalgam is seen in the place where each jet penetrated.

"The number of stamps is five, and their weight is 400 lbs. each. College laboratories very often use a

light three-stamp mill, such as is sometimes used in prospecting or first testing a property. The three-stamp mill is very faulty in principle. There is but one order of drop possible, i.e., 1, 2, 3. If you reverse it you simply call No. 1 stamp No. 3 and get the order 3, 2, 1. In either case there is a tendency to throw the pulp toward one end of the mortar in a bank, leaving the other end die comparatively bare. The three-stamp mill cannot adequately duplicate the ordinary five-stamp mill used in practice, and it should not be adopted for purposes of instructing students. In some laboratories full



WILFLEY TABLE AND CLEAN-UP BARREL

size five-stamp mills have been installed, but this is entirely unnecessary and leads to a great deal of trouble in getting sufficient ore to supply it. Besides this, it furnishes large quantities of products which are awkward to handle in the frequent clean-ups. The small mill for laboratory purposes should as nearly as possible duplicate the machine used in practice, and should strike a fair balance somewhere between a toy and a full-sized mill. The stems are of mild steel turned to size throughout. The cams are of the Canda self-locking type, and are set for the order of drop 1, 4, 2, 5, 3. The arms of the cams are very long and allow of a change of drop from 4 in. to 10 in. The cams are called upon to do their hardest work on the short fast drop, when only a part of the cam toward the point comes in contact with the tappet. In order to stand this usage, the arms and hubs of the cams were made much heavier in proportion to the weight of the stamp than is done in actual practice.

"The mill is fed with a Hendy-Challenge feeder. The actuating arm of the feeder, which is furnished with a long upward curve terminating in a fork, was cut, a piece taken out of it, and welded again to form a short horizontal arm which gives a much more sensitive feed.

"The frame of the mill is a back A frame. It is made throughout of unbled Georgia pine. This type leaves the outside amalgamated plated perfectly free and unobstructed. Each battery post is bolted by a long perpendicular anchor-bolt through the sills to the concrete mortar block. The sills are bolted just in front and back of the mortar block by heavy horizontal tie rods. This gives a construction which is extremely rigid. The inserted plate shows the arrangement of the battery frame as it was first planned. The present arrangement is better because the mortar was turned around to face the other way, leaving the plate entirely unobstructed. The feeder was placed on a platform between the two back struts. The sills were cut off 18 in. in front of the battery post and, as stated above, were bolted by a 1½ tie bolt just in front of the mortar block.

"The outside copper amalgamated plate is 10 feet long with no intermediate drops in it. It is turned up for 1½ in. at each long side, in order that it may be more perfectly cleaned up after each test. It is carried on a table which is supported by four heavy standards which are embedded in two concrete blocks in front of the mortar. Thus the outside plate may be given any desired slope, from one inch per foot to two and a half inches per foot, and is absolultely independent of the mortar. No jar is communicated to the plate from the mortar; and when desired the plate can be easily slid away so that one can work with perfect freedom at the foot of the mortar.

"The mill is driven by a four horsepower, 220-volt, three-phase induction motor. This is provided with external reactance, so that the speed can be varied within wide limits. The motor has a rawhide pinion to minimize the noise of the reducing gear as much as possible.

"This stamp mill was designed primarily for the instruction of mining students, but it can also fulfil other purposes. It is very seldom that a stamp mill is designed to exactly fit the ore that is to be treated. Usually it is well known whether the ore is free-milling or refractory, and it is determined fairly well beforehand what the whole treatment is to be. But the mortar is often designed after some other leading pattern, which is modified to suit some prejudices of the manager of the property. Such a mill as the one outlined above could be made of the greatest service in scientifically testing the ore for a new property to determine the broad lines on which the milling practice should be carried out, and to plan the shape of the mortar, height of drop, etc., according to the results. There should be no difficulty in arriving at very accurate approximations of the best practice for a new ore if enough careful testing is done with the small laboratory machine."



ASSAYING LABORATORY

The four h.p. motor for driving the mill was presented by the Canadian Westinghouse Mfg. Co.; the timbers for the battery frame were donated by Mr. G. J. Partingdon, Jr.; and I. Matheson & Co., of New Glasgow, N.S., furnished the iron work of the mill at cost.

The ore for the stamp mill is broken in the 4 in. by 6 in. Blake crusher, and wheeled in barrows and dumped into the hopper of the Challenge feeder. Thence it goes through the mill and flows down over the plate into a concrete sump. If the tailings are to be concentrated they are pumped thence to a reservoir near the ceiling,

made of an old molasses hogshead, inside of which is a stirrer run by a rope from the main shaft. This stirrer keeps the sand from settling and clogging the discharge. The pulp runs over the Wilfley, the tails going to two large concrete settling tanks in series, each 8 x 4 ft. and 5 ft. deep, and the clear water running to the city sewer. The heads and mids each go to their own settling tank, and the overflow of each is run to the large settling tanks.

Nearly all laboratories in their infancy have had to start in a small way, and have demanded much time and effort from him who has been fortunate enough to first establish them. This mining laboratory possesses nearly all the important types of machines with which



ASSAY FURNACES

the student should be thoroughly acquainted before he starts the practical life of the professional engineer, and it possesses as good a stamp mill for laboratory testing as the author is acquainted with. The laboratory is not as completely equipped as would be desirable for extended research. It is the strong belief of the author, however, that lavish equipment has often led to the confusion of the student, instead of a good, thorough acquaintance with a few important types, and thus the object for which the laboratory is intended is defeated.

The whole laboratory as installed at Dalhousie College has cost about $6,000, plus much time and effort. The results have amply repaid those most interested for the time and labor that they have put into its completion.

FASHIONS IN MINING

J. C. GWILLIM.

Time and place have many values in some phases of mining, quite out of proportion to the value of the commodity involved. Everyone interested in the speculative side of mining feels that there is a time to buy and a time to sell, and the chief concern is to choose these times aright. The general public knows nothing of productive values, and does not really speculate upon them, but upon the optimism of the hundreds or thousands who are interested in seeing the market rise.

A piece of ground adjacent to a bonanza acquires value in much the same way as a piece of real estate in a desirable neighborhood. This idea appeals to the ordinary man, but as a rule there is nothing of real value in it. There are reasons sometimes for the expectation of value; but these are not due to proximity, but to geological conditions which can be understood by very few people. Given two pieces of blank, unprospected ground, the one adjoining a known deposit is preferable to one in no such proximity; both are far more speculative than the piece of real estate. Concerning the fashions in mining, these are as carefully nursed as any fashion of dress or taste of the times. A likely field is pushed forward at first by some real merit, then by wide and subtle advertisement. Men become financially interested in the camp, their friends also come in; there is a good opening for exploitation and inflation of values; property and shares acquired by gift or small payment are talked up until the general public and those who sell to them become interested. Everything combines to make a rising market. Friends have made money; every man who has a dollar in the camp becomes an optimist, and so the fictitious values roll up. The press, the public and the people in the camp itself cannot abide the man who says a word to cool the enthusiasm, so very little on that subject is said. The experience of Southern British Columbia during the decade from 1890 to 1900 illustrates history of a mining boom. Whilst money was pouring into the country and a host of exploiters found themselves busy in keeping up the good times, people lost sight of the inadequate returns from the mines. Later on it was conceded that the costly development would bring about the required production; but before that time the subscribing public ceased to put up more funds, and mining, from the point of view of a great many people, had gone to pieces. Concurrently with the exodus of the brokers, migratory experts and all that floating aggregation which follows a boom, real mining began to pick up. Only properties of merit could stand the withdrawal of outside funds. Many of these even had to cease operations because of the mistrust caused by misrepresentation.

After the Kootenay was dead, in the opinion of those who lived by the money coming in from the outside, and the population had diminished, the production and money coming out of the mines still went on increasing until it is now double that of the best days of the mining boom. At the present time it is much harder to sell a property of real merit than in those days to sell a piece of ground from a few assays. Hundreds of claims held at high figures in 1896 to 1898 have lapsed into Crown lands for want of representation. Yet the mining industry is in a better condition than at any previous time, as far as genuine mining is concerned, and the best interests of the people who intend to make these districts their homes. Ontario itself has cut its teeth in various camps for the last forty years, and in some places has found something to masticate after that process had been endured. Gold, copper and lead have all had a run; there are reports of twenty to forty years ago fully as optimistic and as groundless as those of to-day, upon properties which have now a strong second growth of timber in their excavations. Silver is now a fashionable metal, and a few traces of it can raise financial support. Many of those who are now interested in the phenomenal values of the Cobalt camp may not have even heard of another silver camp in Canada, which, without ever figuring to much extent on the stock market, has produced over twelve million dollars in silver and six million dollars in lead in the last ten years. This has come out of an area in the Slocan of British Columbia, not very much larger than the Cobalt camp; but that B. C. camp, from the point of view of the broker and the public, is decidedly unfashionable.

From another point of view the men and money going into the popular camps does much good, by stimulating industry and development to an extent which would be impossible with the cautious policy of conservative mining. If there are assets in the way of natural resources, these have a chance of discovery and development which they might not have for a very long time, and time alone will show who gets the benefit.

SUMMER MEETING OF A. I. OF M. E.

PROPOSED ITINERARY OF ONTARIO VISIT.

As is announced in another column, the American Institute of Mining Engineers is to meet in Toronto during July. The Toronto meetings will be held at the King Edward Hotel commencing July 23rd. The probable itinerary of the visitors is outlined in the letter from Dr. Miller to Dr. R. W. Raymond, the Secretary of the Institute.

The American Institute of Mining Engineers has a membership of over 4,000. The names of its president and secretary are familiar to mining men all the world over. Mr. John Hays Hammond, the president, is one of the most prominent mining engineers on the continent. Dr. Raymond, who for twenty-six years has held the position of secretary, is an integral part of the Institute. He has devoted his rare abilities almost exclusively to the service of the society. The following letter is self-explanatory:

Copy of letter from Dr. W. G. Miller to Dr. R. W. Raymond:

Dear Sir,—I offer the following as a provisional programme for the meeting of the Institute at Toronto in July, and should like to have your criticisms on it. It will serve as a basis for the work of our local committee.

As the New York trains arrive in Toronto in the morning, it being a night run from New York to Toronto, I suppose a session of the Institute could be held on the afternoon of Tuesday, July 23rd. The other two of the three sessions which you desire to hold might be held on Wednesday forenoon and Wednesday afternoon.

You will see from the programme that I am suggesting only two days' stay in Toronto. My reason for this is that the meeting takes place in mid-summer, and cities are not the most attractive places at that time of the year; moreover, I should think that many of the members of the Institute would prefer to spend the time in the northern mining fields and at some of our northern summer resorts, rather than in the city. However, if you think Thursday should be spent in Toronto, this can be arranged for.

You will also see that I suggest that the address of welcome be given on Tuesday evening rather than at the opening of the session. This would give more time for the addresses, and if they are given in the Parliament Buildings more room will be available.

TUESDAY, JULY 23RD.

Forenoon—Arrival of members of the Institute in Toronto.

Afternoon—Session of the Institute.

Evening—Reception, with addresses of welcome from representatives of the Government of Ontario, City Council, and others in the Parliament Buildings, Queen's Park. Light refreshments.

WEDNESDAY, JULY 24TH.

Forenoon—Session of the Institute.

Afternoon—Session of the Institute.

Evening—Leave by special train for Cobalt at about nine p.m.

If you consider this stay in Toronto too short, we might arrange for a trip by steamer across the lake to Niagara, or some other excursion or entertainment. However, many of the members will be coming to Toronto via Niagara Falls, and they will probably not care to make an excursion thither.

THURSDAY, JULY 25TH.

Forenoon—Arrive at Cobalt, where the members of the Institute and their friends will be met by the Cobalt Local Committee. The party will be sub-divided and will visit various mines during the day. Probably the party, if large, will be sub-divided into three, say, "A," "B" and "C." "A" will visit one mine while "B" is visiting another, and afterwards "B" will be given an opportunity to visit the mine already seen by "A" and vice versa.

Evening—A banquet or reception in the Opera House at Cobalt.

FRIDAY, JULY 26TH.

Forenoon—Visiting mines.

Afternoon—It will depend on the wishes of the members of the excursion as to how Friday will be spent. Mining men especially interested in Cobalt will probably desire about two days to look over the field. Other members of the party may be given a trip farther north on the Government railway, probably over the height of land towards James Bay if they desire, in order to see this newly-opened country, or a steamer trip on Lake Temiskaming may be arranged for. This would start from Haileybury, which lies five miles north of Cobalt on the railway. The party would leave for Temagami, 25 miles south of Haileybury, on the railway, either Friday afternoon or evening or Saturday morning.

SATURDAY, JULY 27TH.

Forenoon—Temagami, steamboat trip up the lake. It would probably suit many of the party to spend Saturday and Sunday at Lake Temagami. This summer resort has been opened only during the last three or four years. It is situated in the Forest Reserve and is surrounded by a virgin bush. There are three very good hotels at the lake—one at the station, one at Bear Island, eighteen miles from the station, known as Temagami Inn, and another, the Lady Evelyn, about thirty-five mlies from the station. These days could be enjoyably spent here, I think, and it would break the monotony of the railway trip.

If any of the members of the party desire to spend a longer period at Cobalt, or wish to visit the new Cobalt silver field on the Montreal River, they could do so, and catch the excursion train at Temagami. This train could leave Temagami either Sunday evening or Monday morning. The run to Sudbury would take about five or six hours.

MONDAY, JULY 29TH.

Forenoon—Arrive Sudbury, met by local Reception Committee. Visit either Canadian Copper Company's mines and works or the works of the Hutton Iron Mine, which is situated twenty-five miles north of Sudbury on the railway. A reception or banquet would probably be provided in Sudbury on Monday evening. Part or the whole of Tuesday could be spent in completing the visit to the mines and works of Sudbury or to the Victoria Mines, west of Sudbury. On Tuesday evening the train would leave for Toronto.

I might say that from Toronto to North Bay the train would run over the Grand Trunk Railway a distance of 227 miles; from North Bay to Cobalt the run would be over the Government railway, the Temiskaming & North-

ern Ontario, the distance being 103 miles. The distance from North Bay to Sudbury is eighty miles.

Should members of the Institute desire to visit the mineral localities of southeastern Ontario, arrangements could be made to make the visit after the Cobalt and Sudbury trip was completed.

It is my intention to prepare a guide book for the use of the members while on this excursion in Ontario. This will give an account of the geography and geology of the districts visited, together with a sketch of the mineral industry in Ontario.

Yours very truly,

W. G. MILLER,

Provincial Geologist.

CORRESPONDENCE

We reprint below a copy of the report of Sectional Committee "A" of the British Institution of Mining and Metallurgy on the standardization of weights and measures. Mr. A. B. Willmott's letter appended deals with this report:

To the Chairman and members of the Central Standardization Committee:

Gentlemen,—The Weights and Measures Standardization Committee submit the following recommendations for adoption by the Central Committee:

1. That the word "ton" shall represent a weight of 2,000 lbs. avoirdupois (29,166.6 oz. troy); that the use of the terms "cwt." and "qrs." be abandoned, and that fractions of a ton be expressed either in pounds or in decimals of a ton.

2. That the "miner's inch" be understood to mean a flow of 1.5 cub. ft. of water per minute.

3. That the word "gallon" be understood to mean the Imperial gallon of 10 lb.

4. That all temperatures be expressed in degrees Centigrade.

5. That gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion."

6. That gold contents of ores, etc., be expressed in money values as well as in weights; and that in this connection the standard value be taken at 85 shillings, or $20.67 U. S. currency, per troy ounce fine gold.

They also suggest that the following questions be appended to any memorandum that may be issued to the members of the Institution embodying the above definitions:

(a) Do you consider the general adoption of the Metric system of weights and measures to be feasible in mining and metallurgical work, or would this in your opinion lead to undue dislocation?

(b) Have you any suggestion to make as to weights and measures other than those already dealt with, which require exact definition?

The question of the adoption of Metric standards has engaged the attention of the committee, as the present movement in that direction in other branches of industry rendered it, in their opinion, inadvisable to ignore it entirely.

The feeling of the Committee, however, is, that while the question should be brought to the attention of the members, it would at present be quite inexpedient to advocate the general adoption of the Metric system in mining and metallurgical work.

On the other hand, an attempt to decimalize existing weights and measures is considered to be a step in the right direction, and as tending to bring about a desirable simplification.

I am, gentlemen,

Yours obediently,

(Signed) H. LIVINGSTONE SULMAN,

Chairman of Sectional Committee "A," Weights and Measures.

December 13th, 1906.

Sault Ste. Marie, Ont., April 25th, 1907.

Mr. C. McDermid, Secretary Institute of Mining and Metallurgy, Salisbury House, London, E.C.:

Dear Sir,—Taking advantage of the opportunity which you have given to members of The Canadian Mining Institute to express their opinions on the proposals made by the Standardiization Committees, I beg to make some suggestions. I would have much liked to see some advanced position taken by the Weights and Measures Committee in regard to the metric system. I quite agree that it would be "inexpedient to advocate the general adoption of the metric system" at the present time. I feel, however, that the majority of engineers favor the ultimate adoption of this system, and believe this can only be accomplished by gradual change. Probably no more opportune time could be found for the partial introduction of the system than when the present standardization is being considered. We have no less than four systems of weights in use in English-speaking countries, namely, Avoirdupois, Troy, Apothecary and Metric, and to add to the confusion several of our weights have dual meanings, as in the case with ton, pound and ounce. No one will deny the advantage of uniformity, and a very considerable number, and I believe the majority, of those giving attention to the matter would favor the metric system. My thought is that so far as weights are concerned, engineers might agree to adopt the metric system at once, and ten years from now, when the metric system of weights will have become familiar to the general population, it will be time to urge the adoption of the metric system of measures. Metric weights can be adopted so easily, and with such slight dislocation of present conditions, that I trust the committee will give this suggestion full consideration. I would suggest a change of the recommendations of the committee to read as follows:

1. That the unit of weight shall be the metric ton, representing 2,204.6 lbs. avoirdupois. That the use of the terms "hundredweight" and "quarters" be abandoned, and that fractions of a ton be expressed in decimals.

2, 3, 4, 5. As given.

6. That the metric system of weights shall be substituted for troy weights in relation to precious metals. That the gold contents of ores be expressed in money values as well as in weights, and that in this connection the standard value be taken at 2,733 shillings (?) per kilogram, or $664.60 (?) U. S. currency per kilogram.

7. The metric system of weights be substituted for the karat and fractions in the weighing of diamonds.

All of which is respectfully submitted.

Yours truly,

A. B. WILLMOTT.

In a recently issued bulletin of the U. S. Geological Survey a statement appears giving the obligation required of employes or members of the staff. These are as follows: He must refrain from publishing facts of a confidential nature, learned in the course of his duties. He further pledges himself not to testify in any mining litigation before the United States, state or territorial courts during his employment on the survey; and for three years after the termination of such employment not to act as expert in mining litigation concerning properties in any district in the United States, upon which he shall have made a full or partial report under the employ of the survey, provided that a period of ten years shall not have elapsed since the completion of the field work to which he was a party and upon which his expert report is based. Confidential geological data collected in the course of mine or district investigations, must not be published without consent of the proper authorities directly interested in said data, and is to be used by the collating or investigating geologist only as a basis for conclusions and generalizations.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Up till the 15th of May it could not be said that coal shipments by water had really, that is, actively, begun for the season. This is a late year. In May of 1906 the Dominion Coal Co. shipped 330,000 tons. They will scarcely do that this May. Predictions have been numerous that the Nova Scotia shipments of coal during 1907 would be much larger than in any previous year. I have myself taken part in the pastime of prophesying. About this time we should be getting doubtful as to the fulfilment of our predictions. But no; though appearances are for the nonce against us, we are quite cheerful. The shipments of the six of the larger companies for the first third of the year should have a depressing effect, but instead all are big with hopes. For the four months of the year four of the companies suffer decreases in shipments, viz., Dominion Coal Co., 18,000; Intercolonial and Nova Scotia Steel and Coal Co., about 2,500 each; while the Cumberland Railway and Coal Co., from a series of troubles, has gone all of 50,000 tons behind. The decrease from these four companies is 74,000 tons. The Acadia Coal Company, on the mainland, and the Inverness Railway and Coal Co., on the island, relieve the situation somewhat, the former having an increase of 12,000, and the latter of 21,500 tons, over the four months of 1906. The net shortage for the four months is therefore 40,000 tons. From the first of June the shipments will be on a scale much larger than in any previous year.

Though last year's shipments were the largest by far on record, the profits of the operators were microscopical. Indeed, it is asserted that of all the companies operating only three showed a balance worthy of the name of profit. It is not, then, to be wondered at if the price of coal has been advanced in Montreal, and the St. Lawrence points generally. And yet this increase in price will not be a means of making the operators wealthy, for the reason that the biggest proportion of the quantity sent to Montreal is on long time, that is, three-year contracts, and that means the same price as last year. In fact, the only company that I know of that has no three-year contracts—I refer to companies shipping by water—is the Nova Scotia Steel and Coal Company. Of course, all of the companies will have some small orders to fill at the increased rate.

Land shipments are greatly hindered by a scarcity of cars. The mainland collieries could almost double their outputs could cars be supplied them in sufficient numbers. This complaint of scarcity of cars is not new, and the wonder is that the I. C. R. authorities do not make provision for increased rolling stock. The late shipping season is given as a reason for the exceptional scarcity at the present time. Hundreds of coal cars are standing loaded with lumber which should have been loaded long ago. The ice has delayed the arrival of steamers on which the lumber is to be shipped. And yet, when all is said, the I. C. R. is to be censured for continued scarcity of cars.

The complaint at some of the collieries still continues as to the scarcity of labor. This scarcity handicaps outputs in some instances. For several years the Dominion Coal Co. has suffered much from a scarcity of loaders, that is, men to load the coal into the pit tubs after it is taken down. Extraordinary efforts have been made to overcome this difficulty this year. In order to secure loaders, special agents were sent to Italy, Belgium and other countries, and the result is that a large number of muscular foreigners have recently arrived. The companies not only suffer from a scarcity of labor, but from the irregularity of the men in coming to work. It is not unusual for twenty-five per cent. of the employees at a colliery to be off work on certain days. Many in the spring go fishing and farming, while in the summer many go frolicking. This is a sign that wages are good; and the funny thing is that these same would be the loudest grumblers were the idleness enforced from scarcity of employment. The collieries will give employment directly to 12,000 men this summer, and nearly as many more indirectly.

The biggest thing in the way of development on the mainland is the opening out of the Allan shafts. Naturally owing to the immense thickness of the seam—forty-five feet to fifty feet—development proceeds slowly. This is a big undertaking, from which big things are expected once the seam is fully opened out. It may be some time yet before the anticipated 2,000 tons per day is reached; at present the output is between two and three hundred tons per day. There should be a steady enlargement of this quantity. Nova Scotia can not only boast of the biggest seam of bituminous coal at present being operated, but of the longest straight, high-angled slope—if I am not mistaken—in the world. The Drummond slope of the Intercolonial Coal Mining Company is now down a distance from the surface of over 7,500 feet, or say a mile and a half. The pitch of the seam is over 21 degrees; therefore the superincumbent weight of the strata at the face of the coal must be something tremendous. The "squashing" almost flat as pancakes of the heavy sticks put in to support the roof bears testimony to this. To take a rake of boxes from the face of the slope to the surface occupies eleven minutes, and yet this colliery can hoist as much coal as when the slopes were less than half the distance. This has been made possible by the employment of heavier haulage engines and thicker steel rope. Twice as many boxes come up on a rake as, say, two years ago. This colliery is over forty years old, and yet is producing yearly more coal than in its younger days. Mr. James Floyd's management of the colliery has up to the present been an unqualified success. In Mr. Blue, as mine manager, he has an able lieutenant.

The men and management at Springhill are to have a trial of the new Industrial Disputes Bill. The men made application to the Department, and have named as their arbitrator Mr. R. B. Murray, of Springhill, while the company has named Mr. Archibald, C.E. I have not heard if they have agreed upon the third man. It is thought that the men believe they have a good case, otherwise they would not have taken the initiative. Our miners are much more reasonable than are the miners in the West. That may be due partly to the fact that they have home leaders, and not foreigners for guides. The P. W. A. is perhaps as desirable a trades union as any on the American continent. Of course, it has its critics, but these are mostly men with Socialistic leanings. To them the P. W. A. is not aggressive enough, which is another word for clamorous. That is, however, the beauty of the P. W. A. Its chief and only paid officer does not need to go round the collieries setting off fireworks in order to make his salary secure. Some would prefer that the P. W. A. was not a semi-secret society. Why should its doors be open to non-contributors? The managers meet and their meetings are not open to everyone, and why should the meetings of the P. W. A.? The meetings of the P. W. A. are for stockholders, so to speak, only, and why should they not be? We ought to be glad that the Western Federation of Miners obtained no footing in Nova Scotia. Wherever in British America that society has found a place it has left discord and strife in its trail.

The British papers have been crowing over an output of 3,865 tons in a day from a colliery in Derbyshire. It is claimed that this beats the world's record. Scarcely. From Dominion No. 2 shaft of the Dominion Coal Co. there was hoisted in a day of ten hours no less a quantity than 4,603, or over 700 tons more than what is claimed as the best day's hoisting in the world. Nova Scotia may be a small place, but for its size it does some wonderful things. It has a coal company that can hoist more coal, ship more and unload from its steamers more coal than any other coal company on the wide continent. And we are only at the beginning of things. It is only ten years since the coal trade really began to grow, and at the rate it is expanding it will be of gigantic stature by the expiry of another ten years.

ONTARIO.

Cobalt, May 16.—The "hugger-mugger" fashion in which Cobalt stocks are introduced in England has been annoying the London Times. Advertisements of the Cobalt Central Company aroused the wrath of the Thunderer, and it proceeded to ask some inquisitive questions. "How much was paid for the properties, and how much working capital has the company?" asks the Times. It then goes on to say that British capital may well fight shy of a field of exploiters who adopt such questionable methods of calling attention to it.

No specific reply can be obtained at this end of the line to these caustic criticisms, but a disposition is shown to give visitors access to the property. While the company holds something like 220 acres of land, only a small portion of that acreage is under development, the section adjoining the Nipissing, and including the Big Pete mine. A 100-foot shaft has been sunk there with considerable drifting, several good veins have been struck, and a concentrator is in operation treating the wall-rock, which is rich in low grade ore. Up to date three shipments have been made, but none were full carloads. The capitalization of $4,000,000 would seem to be quite ample in view of these results. This capitalization is advertised as being low for the acreage, but as the capital is being used for the development of only a small part of the holdings, the point of this argument is not readily apparent.

That great minds sometimes run in the same channel is shown by the fact that one of the local papers in the Cobalt field is asking questions almost as pertinent as those of the Times. The "Haileyburian" wants to know why the directors of the Green-Meehan do not issue statements telling their shareholders a few facts. The mine is a good one, says the Haileyburian, and ought to make money. Why cannot the people who have invested their money be given some idea where they stand?

No adequate reply can be obtained to these questions either, but at the mine a visitor is shown a very likely looking property. Up to the present all work has been in an open cut, by which fairly good results have been obtained. A strong vein can be followed the entire length of the cut, and the ore taken out runs at a good average. A complete plant is now being installed and a much larger production is promised for the summer. A shaft is being sunk from the end of the cut, and drifting and stoping will soon be possible.

Without attempting to pass judgment upon these criticisms, it may be said that whatever adverse comments have been made regarding this field have been based on failure of promoters to take the public fully into their confidence. Glittering generalities constitute a big part of advertising methods on this side of the ocean, but sometimes they fail to convince even the home folks, let alone those in foreign parts. There have been some big disappointments in the Cobalt field, and it is natural the public should be a bit chary. Candor alone will win renewed confidence.

Snow, rain and rising temperature have been received with great gladness here, for it seems certain that the long-delayed spring has at last arrived. All signs point to the breaking up of the ice in Lake Temiscaming within a few days, and the rapid opening of the rivers. Snow is still heavy in the bush, and the lakes in the north country are still covered with a thick coating of ice, but a few more mild days will make a great change. Then will come the rush north. Hundreds of prospectors are lined up along the trails, and hundreds more are ready to make a quick start from the settlements. The "oldest inhabitant" is not so very old that he can remember a season when the ice went out so late. Fifteen years ago it went out as late as the 15th, but this year it is still here on the 16th. As a result prospectors have been much handicapped, and now have but a short season before them.

Opinion is divided as to which of the northern fields will produce the greatest results this summer. First on the list is Larder Lake, which will no doubt draw the larger number. Much is expected of this territory, and it will take a good deal to fulfill expectations. That gold is there is not doubted, but to what extent will hardly be known before autumn. The Montreal River is better known, and confidence is felt in big returns from there. That country has been more thoroughly prospected than Larder Lake, and considerable work has already been done on the development of some of the claims, notably those of Munroe and Saville, which were among the first staked and the first recorded from that section. The Abitibbi is also going to draw some prospectors this season, and already some very rich specimens of gold-bearing rock are shown quietly by men who have returned from there.

That there is to be a marked increase in the production of the camp is indicated by the figures for the first three months. Up to April 1st about 3,000 tons of ore were shipped. There were 26 mines among the shippers, and as six sent out only one car each, the remaining ten must have shipped an average of about nine cars each month. In 1904 the camp produced 158 tons of ore; in 1905, 2,144 tons; in 1906, 5,129 tons. Now with a record of 3,000 tons for only three months of this year, it is evident that the output for 1907 is to be greatly increased. There are several new mines among the shippers, whose output will increase, and several others will make their first shipments soon. The production at some mines has been curtailed owing to changes of equipment in progress, and at others the product has been held back in hopes that market prices would improve. That so much should have been shipped under these conditions gives some idea of what may be expected during the year.

During the past week some rich strikes have been made by some of the well-established companies. Two finds of native silver veins were made on the Buffalo, and Manager Jones went to New York and Buffalo with good reports for his directors. At the Trethewey nearby two promising leads have been reached in trenching. At the Nova Scotia another vein, two inches of which is solid silver, has been reached at the 20-foot level. At the Red Rock a four-inch vein of native silver is said to have been reached. The Cobalt Central has struck another vein similar to those found recently. A two-inch vein very rich in silver was reached at the Temiskaming.

Among the visitors now in camp is Mr. Eric H. Rose, the senior member of the firm of Rose, Van Cutsem & Co., bankers and brokers, London, England. This firm floated the stock of the Townsite Mine, which is owned almost entirely in England, and is interested in other Canadian and American enterprises. Mr. Rose expresses himself as well pleased with the progress made not only at the Townsite, but in the camp generally, since his last visit. He says English interest in Cobalt stocks is increasing, and that capital from the other side can be drawn to Canada if safe and conservative methods are followed.

Another English visitor is Mr. R. Jackson, a stock broker in Leeds. He has handled Cobalt stocks for a year or more, and says investors in the North of England are awakening to the opportunities offered by this field.

During the past week Mr. W. F. Mitchell has been in the camp, coming direct from Los Angeles, Cal. Mr. Mitchell is a large owner in the Casey Mine, and is part owner of gold mines in California and coal mines in Nova Scotia.

The machinery at the Casey Mine was started Monday, in presence of several of the directors. Hand work has been in progress all the winter, and conditions are favorable for rapid production now that the plant is complete.

The O'Brien Mine recently shipped a 32-ton car that brought $125,000 at the smelter. This is at the rate of nearly $4,000 per ton, and sets a new record for the camp.

The big vein at the Temiskaming is holding its own in splendid shape. It is almost two feet in width, and runs 12,000 ounces per ton and upwards.

The main shaft at the Temiskaming and Hudson Bay Mine is now down 40 feet. The big vein is holding its width, and considerable high-grade ore is sacked ready for shipment.

The Nova Scotia Mine, where some remarkable slabs of silver have been found, has another car of fine ore ready for shipment. Steady production now seems assured.

A car of rich ore is ready for shipment at the Kerr Lake Mine, and with the completion of the new plant there should be large shipments from now on.

Mr. Joseph Houston, formerly in charge of the O'Brien Mine, is now in charge of the Right of Way, where a larger plant is being installed.

Mr. George N. Rounds, a mining engineer from Trinidad, Col., is in charge of the Sutton Bay Company's claims on the Montreal River.

Mr. Rupert Simpson is developing the Sutton Bay Company claims on Sutton Bay. He was formerly engineer in charge at the Townsite.

Mr. John A. Macdonald, formerly in charge of the Silver Mountain Mine, is now superintendent of the Foster Mine.

In spite of the numerous "newspaper" reports of the closing of the Foster Mine, work is progressing rapidly, and under the able management of Mr. H. V. Adler, systematic development work is being done and high-grade ore is being taken out daily. Mr. John McDonald, formerly of the Trethewey, has been appointed mine captain.

Another valuable vein has been struck on the Temiskaming Mining Company's property. One of the richest cars of ore from Cobalt was shipped by this mine last week.

The mine owners and other mining men must regret the absurd articles sent out of the camp by the numerous reporters that are loose in the camp. The absurdity of some articles prove amusing, but when the mining interests are sacrificed for "copy" and all sorts of reports are published, it is about time that competent newspaper men were procured for the work.

Every train brings its quota of prospectors and those interested in the field. The Montreal River is now open, and hundreds have gone into that district already, and it would not be the fault of the men if rich finds are not made before fall. It is safe to predict that by the time the river is once again frozen over the silver field will have been extended many miles.

Mr. R. L. Borden, leader of the Conservative party in the Dominion Parliament, was in Cobalt last week for a few days, and was greatly pleased with his visit.

Mr. R. R. Gamey, M.L.A., was in the camp last week looking over his numerous mining interests.

Mr. F. C. Loring of the Trethewey Mine has returned to the camp.

Mr. D. B. Rochester, manager of the Cobalt Lake Mining Company, was in Toronto for a few days last week. Mr. Fralick, mining engineer for the company, is in Ottawa for a business trip.

The Coniagas Concentrating Mill is being constructed, and Mr. Fraser Reid, formerly of Craigmont, will superintend the running of it.

The Mining Inspectors are in town, prior to their departure for the different fields. Owing to the energetic prospecting carried on during the winter months, they will have great difficulty in coping with the situation, but the Department have taken great pains to procure the best possible men, and the prospectors have every confidence that their interests will be well looked after.

Much satisfaction is expressed in camp over the appointment of Professor Mickle as Mines Assessor for the Province. Professor Mickle is especially suited for the position, being a man of recognized integrity, and also one who is thoroughly acquainted with the mining situation of the Province.

GENERAL MINING NEWS

BRITISH COLUMBIA.

The Payne Mine, now controlled by Montreal capital, is to be re-opened. In its day it yielded nearly a million and a half dollars in dividends.

The Wellington Colliery Company, of Cumberland, has closed a contract to ship 20,000 tons of coal to Nome.

The Slocan district is showing decided signs of revival.

Mr. Neil McEachren is to drive a 50-foot tunnel on his large lead of free milling quartz on the west bank of the Columbia River, between Revelstoke and Arrowhead.

The main shaft of the Centre Star Mine, Rossland, is completed to the fourteenth level, and a pocket has been cut below this level. The new hoist, ordered on May 4, 1906, is only now ready for operation.

Electrical locomotives are now being used on the third and eleventh levels of the War Eagle, and on the fourth level of the Centre Star. They are giving satisfaction.

Atlin, B.C.—A new company has been formed to work the placer gold deposits of Otter Creek, near Surprise Lake. The property is about five miles in extent. The new company's name is The Otter Hydraulic Gold Mines Company. It will be under the joint management of Messrs. W. R. Jamieson and H. Malvin.

The Cariboo Mine, Camp McKinney, has been unwatered to the 400-foot level, and new timbers have been put in. Tracks are being laid in the drifts and cross-cuts. Mining will be actively started in the middle of May, when 10 stamps will be put in operation.

The tunnel on the Nicola Valley Coal and Coke Company's property at Coal Gully, has been driven in over 600 feet. The Company is supplying the railroad with 100 tons per week.

On the west side of Bowen Island, 18 miles north-west of the City of Vancouver, a copper property is being worked. A shaft 6 x 9 feet is being sunk. Part of the areas are on the water edge. A group of Winnipeg capitalists are the prime movers in floating a $1,000,000 company to operate these claims.

A seam of coal has recently been discovered in the Nicola district a few miles south of the town of Nicola.

A 200-ton mill is being erected at the Blue Bell Mine, operated by the Canadian Metals Company. Mr. S. S. Fowler is acting as consulting engineer, and Mr. J. C. Dufresne is superintending the work.

Dr. J. Bonsall Porter, of McGill University, visited Greenwood on May 10th.

The Bertha Consolidated Company, whose properties are situated in the Kettle Valley, have struck ore in their new tunnel.

G. B. McMillan's action against A. D. Wheeler and wife for $25,000 commission on the sale of the Krao Mine, was dismissed with costs by Mr. Justice Clement.

ONTARIO.

Cobalt.—Owing to the condition of the roads shipments from Cobalt have been somewhat restricted of late, but on all the principal properties development work is being very actively prosecuted, and interest in the district in general is being well maintained. For the four months ending April 30th, production aggregated 6,742,667 pounds, or nearly two-thirds of last year's entire output. The most important shipper has been the O'Brien, followed closely by the Nipissing, although the latter, it should be added, has been prevented from sending out ore recently on account of the breaking up of the ice in Cobalt Lake. The Cobalt Lake Mine is now about to commence shipments, and two carloads of ore have already been sacked, while another carload of smaltite will be ready to ship towards the end of this month. The Coniagas continues to make an excellent showing, and is now working six veins, from which some very high-grade ore has been mined. Some 1,500 feet of drifting and cross-cutting has been done at the 75-foot level, while it is expected that the new concentrator, having a capacity of 100 tons daily, will be completed for operation before the close of the month. A new strike

is reported to have been made recently on the Buffalo, a rich new vein eight inches in width having been uncovered. The installation of a concentrator at the Trethewey is under contemplation, as there is a large tonnage of relatively low grade material which might thus be profitably treated. The Erie-Cobalt Company has ordered additional machinery, and work is being carried on with double shifts on the Lorraine, where the shaft has reached a depth of a hundred feet. A plant is also to be installed on the Temiskaming and Hudson Bay Company's property, while a five-drill compressor and steam hoist have been installed at the Wabo. At Kerr Lake the Jacobs Mine is said to be looking exceptionally well. The report circulated that the Foster Mine had closed down was entirely foundationless. The mine is being systematically developed, and appears to be under honest and capable management. At the Nova Scotia some 500 feet of drifting has been done at 60-foot level, in addition to work at the 110-foot level, and on Shaft No. 3. It is expected that a shipment will be made shortly.

Larder Lake.—The inclement weather has to some extent checked the rush of prospectors to Montreal River and Larder Lake, but it is expected that before the first of June travel will be unprecedented. A stamp mill has been ordered for the Blue Bell Mine, at Larder Lake, which property will be under the direction of Mr. W. E. Hotson, a mining engineer of New York.

The following inspectors have been appointed by the Ontario Mines Department. No especial districts have been assigned to each. They will work generally, as need arises, over the whole Province: Mr. A. H. A. Robinson, Mr. A. G. Burrows, Mr. G. C. Mackenzie, Mr. James Bartlett, Mr. G. R. MacLaren, Mr. David Houston, Mr. C. W. Murray, Mr. R. Irwin, and Mr. E. Wade.

The Grace Mine, in Eagle Lake district, will be re-opened soon. Mr. J. H. Caslor, of Buffalo, is putting up a stamp mill. The mine is advertising for miners and carpenters.

The 35 feet by 64 feet power house at the Nancy Helen Mine is completed, and the foundations for the machinery are ready. A hundred horsepower gas-producer is to run an engine for a six-drill compressor.

A discovery of pyrrhotite is reported from the north side of Lake Wahnapitae. It is said to carry 3 per cent. nickel and 1 per cent. copper.

NOVA SCOTIA.

The Nova Scotia Steel Company is about to commence operations at the new colliery at Point Aconi, which will be known as Sydney No. 6.

In an interview at Montreal, Mr. F. P. Jones, of the Dominion Iron & Steel Co., is reported to have stated that an increase of 50 per cent. in production from the company's works is anticipated for this year, and it is thought that the monthly average will reach 30,000 tons.

The Dalhousie-Kings School of Mining, Glace Bay, C.B., has closed for the summer, after a successful season's work. The average attendance was 35. Instruction was given in English, mathematics, chemistry and surveying.

It is understood that the North Atlantic Collieries, Limited, will operate areas in and around Port Maria. The company has 36 leases. There are six seams of coal running through these areas, and they possess a very large estimated tonnage. The present shaft of the Gowrie and Blockhouse will probably be utilized. The leading directors of the company are Messrs. B. F. Pearson, of Halifax, George E. Drummond, of Montreal, and H. M. Whitney, of Boston. The company was organized in 1903, under the Joint Stock Companies' Act of Nova Scotia.

The Nova Scotia Royal Gazette of May 8th makes formal announcement of the appointment of Mr. Frederick H. Sexton to the Directorship of Technical Education in Nova Scotia, under the provisions of the Act passed at the last session of the Legislature.

Sydney No. 3 colliery, owned by the N. S. Steel and Coal Co., is to be operated on single shift. General Manager T. J. Brown believes that the cost of production will thus be considerably lessened.

It is reported that a deposit of infusorial earth at St. Ann's, Cape Breton, is to be worked again. It is owned by New York capitalists.

The coal-washer of the Londonderry Iron and Mining Company, Londonderry, N.S., was destroyed by fire on the morning of May 8th.

Two electric pumps are working in the Hub Colliery, Glace Bay. The Hub was flooded last winter on account of a fire. Hoisting cages have been installed, and the work of cleaning up is proceeding expeditiously.

The Nova Scotia Steel and Coal Company is pushing the work of shaft sinking on Sydney No. 4. It is expected that this mine will start producing coal during the coming autumn. The company owns the land in the vicinity of the mine.

ALBERTA.

From Edmonton the report comes that gold strikes have been made on Little Smoky River, beyond Yellow Head Pass.

EXCHANGES.

The Mining Investor for May 13th has been received.

Mining Engineering (London) for May has been received.

The Coal Trade Journal, May 15th, notes the strong position of the anthracite coal market.

In the Mining and Scientific Press, May 4th, Mr. T. A. Rickard writes of "Great Gold Mines."

The Journal of the Franklin Institute for May gives an able paper on the "Modern Locomotive."

The Science and Art of Mining, May number, contains an instructive article on "Indian Coal Fields."

The Mining World, May 11th, gives a paper on the "Determination of Silica and Alumina in Iron Ores."

South African Mines, April 13th, in an article on "The Metallurgy of Gold Fields' Mines," specifies some of the advantages of tube mills.

The Engineering and Mining Journal, May 11, presents a copiously illustrated descriptive article on "Magnetic Separation of Iron Ore in Sweden."

In the May 18th number of the Engineering and Mining Journal is an excellent description of "The Tungsten Deposits of Boulder County, Colorado."

The Mining Journal (London), May 4th, has been received. In this issue Prof. William Gowland's presidential address before the Institution of Mining and Metallurgy is concluded. The leading editorial deals with "Railway and Mining Development in China."

The Maritime Mining Record, May 8th, makes some very caustic comments on certain pseudo-Socialistic writers who spread themselves in the daily press. Many of these "Socialists," the Record points out, are irresponsible babblers. The Record does well to scourge those silly people whose chief desires are first to see themselves in print and next to stir up strife.

The March number of our contemporary, The British Columbia Mining Record, has reached us. The Mining Record is, as usual, bright, clean and attractive. The March number contains an article on "Copper Mining—an Important Industry in British Columbia," from the pen of Mr. E. Jacobs, the managing editor. Mr. Jacobs exhibits in all his work a keen, incisive style and a remarkably thorough knowledge of all matters pertaining to the mining industry of the Province which his paper so ably represents.

PUBLICATIONS RECEIVED

Bulletin No. 32 (May 9th, 1907) of the Institution of Mining and Metallurgy, has its usual quota of excellent technical papers.

The Quarterly Bulletin of the Imperial Institute, Vol. V., No. 1, contains an exhaustive article on the occurrence of graphite. A previous article dealt with its uses.

Both bulletins are beautiful specimens of typography. They are profusely illustrated with photographs and with geologic maps and sections. Twenty-eight micro-photographs accompany the reports.

Bulletin No. 1. (New Series). New Zealand Geological Survey. "The Geology of the Hokitika Sheet, North Westland Quadrangle," by James Mackintosh Bell, M.A., Ph.D., F.R.G.S., assisted by Colin Fraser, M.S.C., Wellington, New Zealand, 1906.

Bulletin No 2. (New Series) New Zealand Geological Survey. "The Geology of the Area Covered by the Alexandra Sheet, Central Otago Division," by James Park, M.I.M.M., F.G.S., etc., Director of the Otago School of Mines.

These bulletins are of more than passing interest to Canadians, in that they have been prepared and issued under the direction of Dr. J. M. Bell, a graduate of Queen's University, and a nephew of that distinguished Canadian geologist, Dr. Robert Bell.

The general and economic geology of two important districts of New Zealand is carefully described. Dr. Bell has emphasized the economic side of his work as much as possible. The description of certain gold-bearing areas is extremely interesting. We shall, at an early date, have occasion to refer more particularly to this feature of the reports. Meanwhile we wish to record our pleasure in receiving such excellent examples of painstaking and capable departmental work.

"Notes on the Mineral Fuel Supply of Canada," a pamphlet from the Transactions of the Royal Society of Canada, has been received. Dr. R. W. Ellis, of the Geological Survey, is the author. This pamphlet will be the subject of extended notice in the next issue of the Canadian Mining Journal.

CATALOGUES AND TRADE PUBLICATIONS

Bulletin No. 12, issued by the Jeffrey Manufacturing Company, Columbus, O., is entitled "The Care of Electric Mine Locomotives in Service." This is virtually a manual of directions for practical men. The Jeffrey people signify their desire to put it in the hands of all engineers and mine managers. It is amply illustrated with photographs and diagrams.

From Allis-Chalmers-Bullock Limited, is received Bulletin No. 1410. The subject is the Gates Tube Mill for nut pulverizing in mining work. In South African gold mines the tube mill, as a profitable addition to the stamp mill, has made a permanent place for itself. Preliminary treatment of a gold ore in the tube mill increases the capacity of the stamp mill and gives an even product. The Gates Tube Mill, as manufactured by the above firm, is simple in construction and thoroughly satisfactory in service.

"The Deister Concentrator," Mr. C. B. Fitch, Canadian agent, is the subject of a small pamphlet issued by the Deister Concentrator Company, Fort Wayne, Indiana. The Deister occupies a floor space of eight feet square, and, crated for shipment, weighs 1,000 pounds. It requires but one-fifth horsepower, and is operated at a speed of 320 r.p.m. The main frame, supporting the driving gear, is of eight-inch channel steel, held together by steel plates. The table bases are made of the best grade of charcoal iron, so arranged as to prevent longitudinal motion. A wedge adjustment provides for tilting the table, which is supported in ball and socket bearings. The stroke and differential can be changed at will while the table is in operation. The deck (or working surface) is rhomboidal in form and is made of wood covered with linoleum. The surface measures 5 feet by 8 feet. The feed box extends the whole width of the deck, thereby ensuring even distribution of pulp. Alternate riffles extend to the extreme edge of the table, the intermediates being shortened. The riffles are arranged in groups, each group being separated from the next by a higher riffle, which has the effect of flooding the preceding group of riffles with a comparatively quiet body of water, in which fines and slimes readily settle and stratify. The advantage of this device is obvious. The movement of minerals is sidewise. The coarsest and heaviest minerals are expelled from the table within 18 inches of the feed and the lighter and finer minerals at points nearer the lower end of the table.

PERSONAL AND GENERAL

It is interesting to note that Canada's experience of the difficulty of securing and retaining the services of qualified geologists to undertake Government work is by no means unique. Thus Mr. S. F. Emmans, in a report of the United States Geological Survey, notes with regret "the increasing exodus of members of the economic force of the survey in consequence of their employment by large mining organizations at salaries much greater than those they have been receiving from the Government seriously impairs the efficiency of the work of this branch of the survey. It is only by years of practical experience in the field that the geologist, however excellent his preliminary training, becomes competent to carry on independent work in investigating a mining district, and the loss of trained men in this work is, for a time, irreparable."

The terms of the resolution recently passed by the House of Commons, providing for a bounty on pig iron and steel manufactured by electrical processes, reads as follows:

"That it is expedient to provide that the Governor-in-Council may authorize the payment out of the consolidated revenue fund of the following bounties on pig iron and steel ingots manufactured in Canada for consumption therein, when such pig iron and steel is the product of Canadian iron ores smelted in Canada by electricity, viz., on pig iron manufactured from Canadian ore by the process of electricity smelting during the calendar years: 1909, $2.10 per ton; 1910, $2.10 per ton; 1911, $1.70 per ton; and 1912, 90 cents per ton. On steel ingots manufactured by electric process direct from Canadain ore, and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity from Canadian ore during the calendar years: 1909, $1.65 per ton; 1910, $1.65 per ton; 1911, $1.05 per ton; and 1912, 60 cents per ton."

Apropos of the foregoing, that in Sweden, where about one million tons of iron ore, or one-fourth of the ore raised, is smelted in the country, electrical methods are becoming more and more general. The present demands for electricity may be estimated, according to Mr. E. Hammerstrom, in "Teknish Tidskrift," at 111,000 h.p. for iron smelting, 100,000 h.p. for railway working, and 320,000 h.p. for nitric acid manufacture.

Mr. S. F. Parrish, at one time manager of the Le Roi Mine, at Rossland, B.C., has opened an office as a consulting engineer at Tonopah, Nevada.

Mr. R. B. Lamb, late of Hedley, B.C., has been retained as consulting engineer by the Barnes-King Mining Co., of Kendall, Montana.

Mr. W. H. Jeffrey has resigned the superintendentship of the Crescent Mine, near Greenwood, B.C., to assume the management of the LaRose Mine at Cobalt.

Col. J. H. Conrad, one of the principal owners of the new mining camp near White Horse, Yukon, is visiting New York on business in connection with his Western interests.

Mr. James McEvoy, geologist and chief engineer for the Crow's Nest Pass Coal Co., has had a severe attack of pneumonia, from which, however, he is now recovering. He hopes to resume his duties shortly.

Mr. W. C. Thomas has been appointed resident general manager for the Dominion Copper Co. at Phoenix, B.C., in succession to Mr. T. R. Drummond. Mr. George Williams has received the appointment of the company's smelter superintendent.

Mr. Bernard McDonald, well known in Canada, has opened an office at 40 Wall St., New York.

Mr. R. R. Hedley, after visiting the Cobalt and Sudbury districts, returned on May 12th to British Columbia, where he will commence at once the special work for which he has been retained by the Federal Department of Mines.

Mr. S. S. Fowler, of Nelson, B.C., general manager of the Canadian Metals Co., is visiting New York.

Mr. Bruce R. Warden, of the C. P. R. Mining and Metallurgical Department, Bankhead, Alta., has been retained to superintend the installation of machinery at the Nicola Coal and Coke Co.'s Middleboro Colliery, at Coulee, B.C.

Mr. Paul Johnson, for many years identified with western metallurgical works as manager, respectively, of the Hall, Greenwood, and recently of the Hadley Smelter, is on his way to Europe, where he will probably settle.

Mr. W. H. Aldridge, general manager of the Consolidated Mining and Smelting Co. of Canada, spent some days in business in Montreal and Toronto during the past week. Mr. Aldridge expressed great satisfaction that the coal strike in the West had been settled, and is inclined to the opinion that there will be no further trouble of this nature for some time, at least, so far as the coal mines are concerned. The metal miners, however, are now demanding a general increase of wages of fifty cents a day, at a minimum wage of four dollars a day for miners and three dollars and a half for muckers, which in view of existing conditions is regarded as exorbitant. As a result of the recent coal strike, the Boundary smelters closed down, and it is not expected that operations will be resumed until June.

Mr. H. Harris, recently superintendent of the Hall smelter, has been appointed superintendent of the smelting works at Hadley, Prince of Wales Island, Alaska, under Mr. Thos. Kiddie.

Mr. J. C. Houston has accepted the post of superintendent of the Right of Way Mine at Cobalt.

Mr. W. R. Brock, Professor in Geology, Kingston School of Mining, will make a report on the Larder Lake gold area for the Ontario Bureau of Mines during the coming summer. Mr. Brock is especially well fitted for this work, his reports on the gold and copper deposits of British Columbia having attracted much attention during recent years. The Government is to be congratulated on securing the services of so competent a man to make the report on this district, which is now attracting so much attention.

Mr. R. E. Hore, who was one of the assistants of the Provincial Geologist of Ontario during the last year, is now in charge of a prospecting party for Mr. D. O'Connor, of Temagami.

Mr. M. B. Baker, Lecturer in Geology at Kingston School of Mining, is spending the summer at the University of Heidelberg, and is working under the well-known Professors Rosenbusch, Goldschmidt and Salamon.

Mr. J. Walter Wells, at one time Provincial Assayer, is in charge of an exploring party in the Temagami-Montreal River section.

The paper on "Grogs" read at the recent meeting of the Ontario Clay Workers in Toronto, by Mr. M. B. Baker, Lecturer in Geology of the School of Mining, Kingston, has appeared in half a dozen papers all over the world, and is said to have been translated into French and Swedish. This affords further evidence of the good work which Mr. Baker has been doing in connection with the clay-working industry.

Mr. Eugene Coste has returned to Toronto from Colombia, South America, where he went early in March to examine certain oil fields.

Mr. G. R. Mickle, Professor of Mining, School of Practical Science, Toronto, has accepted the position of Assessor for the Ontario Mines Department. The duties devolving upon the Assessor will be of an extremely exacting nature. Mr. Mickle should fill the requirements of the situation very satisfactorily.

Mr. H. E. T. Haultain has been appointed general manager of the Canada Corundum Company, Craigmont, Ont.

Mr. W. A. Carlyle, for the past seven years general manager of the Rio Tinto Copper Mines, Spain, has resigned that position to take up consulting work in London, where his temporary address is Bank of Montreal, Threadneedle St.

Mr. A. A. Hassan, mining geologist and consulting engineer, is in the Montreal River district, studying geological conditions. He will also visit Larder Lake and Lady Evelyn Lake, and will examine the Nipissing and several other Cobalt properties. Subsequently Mr. Hassan will proceed west to examine several mines near Nevada City, California, and from there into the High Sierras to watch the development of the Bishop Creek Gold Company's Mines, near Bishop, California.

Dr. J. Mackintosh Bell, Director of the New Zealand Geological Survey, will visit Canada in July. Dr. Bell expects to spend some weeks in Ontario.

Mr. O. N. Scott, consulting mining engineer, left Toronto on May 14th to inspect mineral claims in the Sudbury district.

At the Great Cobar Copper Mine, New South Wales, of which Mr. J. D. Kendall is consulting engineer, arrangements are being made for doubling the present output by installing additional plant having a nominal capacity of 1,000 tons a day, at a cost of £160,000.

The annual meeting of the Royal Society of Canada was held last week at Ottawa. Feeling reference was made to the recent death of the late Dr. W. H. Drummond, and a poem to his memory by Mr. William Campbell was read, of which the two closing verses ran:

"But here on the shores behind him,
Where the manly heart is still,
He leaves a vacant place in our song
No other singer can fill.

He who gave us, so joyous,
Amid all our doubtings and fears,
Those heart-deep songs of a people,
Brimming with laughter and tears."

STATISTICS AND RETURNS

Cobalt ore shipments for the week ending May 11, 1907:

	Pounds.
May 6, Coniagas Mine to Perth Amboy	62,000
May 10, Coniagas Mine to Perth Amboy	62,000
May 8, Right of Way Mine to Newark, N.J.	1,400
May 8, Trethewey Mine to New York	43,360
May 8, O'Brien Mine to Perth Amboy	65,210
	233,970

Cobalt ore shipments for the week ending May 18, 1907:

	Pounds.
May 13, O'Brien Mine to Perth Amboy, N.J.	88,100
May 17, O'Brien Mine to Perth Amboy, N.J.	82,170
May 14, Coniagas Mine to Copper Cliff	41,760
May 16, Coniagas Mine to Perth Amboy	63,300
May 18, Coniagas Mine to Perth Amboy	64,560
May 15, Temiskaming Mining Co. Ltd. to Bergen Junction, N.J.	54,500
	396,390

Following are copper returns for the week ending May 11 for the British Columbia districts as specified:

BOUNDARY SHIPMENTS.

Mine.	Week.	Year.
Mother Lode	3,840	69,787
Emma	153	3,246
Providence	38	568
Oro Denoro	82	1,338
Other mines		291,832
Total	4,113	366,771

ROSSLAND SHIPMENTS.

Centre Star	1,469	30,265
Le Roi	1,708	46,662
Le Roi, No. 2	374	7,937
Le Roi, No. 2, milled	1,050	3,370
White Bear	123	775
Other mines		1,500
Total	4,724	90,509

KOOTENAY-SLOCAN SHIPMENTS.

Sullivan	600	11,400
La Plata, milled	425	8,075
Second Relief, milled	145	2,765
Queen, milled	185	3,515
Eva, milled	230	230
Hunter V.	80	1,813
Queen Victoria	159	1,245
St. Eugene	133	5,141
La Plata	58	1,235
Arlington, Slocan	47	283
Vancouver	60	201
Other mines		6,373
Total	2,122	42,276

The total shipments from the mines in the above districts for the past week were 10,959 tons and for the year to date 499,556 tons.

Shipments from the Cumberland Railway and Coal Company collieries, Springhill, N.S., amounted to 29,872 tons for the month of April.

The following figures, indicating German consumption of foreign copper for the period January to March, 1907, inclusive, have been supplied by L. Vogelstein & Co., 100 Broadway, N.Y.

	Tons.
Imports of copper	26,506
Exports of copper	2,113
Consumption	24,393

as against 28,700 tons for the same period in 1906. Of this amount 7,007 tons were imported from the United States.

COMPANY NOTES

The nineteenth ordinary general meeting of the Tilt Cove Copper Company (Newfoundland) was held on May 6th at their offices, 9 Queen St. Place, London, E.C. The Committee of Management reported to the shareholders the balance sheet and profit and loss account for the year ending December 1st, 1906. The profit and loss account shows a credit balance of £47,508 10s. 6d. The Cape Copper Company's Tilt Cove establishment audited accounts for the year ending 31st December, 1906, show a net profit of £99,340 7s. 10d. This balance has been divided equally between the Cape Copper Company and the Tilt Cove Copper Company, as provided for by agreement. Out of the available profit of £50,985 3s. 8d. the committee recommended a final dividend of 4s. 6d. per share, making a total distribution for the year of 10s. 6d. per share, or 26¼ per cent., leaving the sum of £3,510 9s. 11d. to be carried forward to the next account.

The Devil's Rock Silver Mining Company, Limited, has secured the right of increasing its capital stock from $500,000 to $850,000, by the issue of three hundred and fifty thousand shares of new stock at $1 each.

At a meeting held on May 9th the directors of the Crow's Nest Pass Coal Company decided to recommend to a special meeting of shareholders on May 21st the issue of $500,000 of new stock. The growing necessities of the West demands an expansion of the company's facilities.

By supplementary letters patent dated April 16, 1907, the powers of the LaRose Mining Company, Limited, have been extended to enable them to carry on in all their branches the operations of a mining, milling, reduction and development company generally in any part of the Province of Ontario.

The International Steel Company of Canada, Limited, has increased the number of its directors from three to seven.

Messrs. Peacock Bros., of Montreal, have received an order from the Nova Scotia Steel Co. for an immense air compressor for their Newfoundland Mines. The compressor is to have a capacity of 3,000 cubic feet of free air per minute, and is to be delivered by the end of August.

Cobalt, Silver Queen, Limited (Ontario).—The report of this company for the year ending March 31st, 1907, states that development work was restricted by the non-arrival of machinery, but this, notwithstanding 442,141 lbs. of ore were shipped, and 109,273 lbs. remain on hand. The workings, including the sinking of a shaft to a depth of 145 feet and laterals driven east and west, aggregated nine hundred feet, and ore to the value of $700,000 was blocked out. During the year $120,000 was distributed to shareholders. The ore continues to maintain its width and value. The balance sheet shows receipts of $157,915 from the sale of ore and disbursements on account of construction, machinery, etc., of $17,859; and of mining, labor and supplies, $34,191.

Dominion Copper Co. (British Columbia).—This company has arranged to retire a part of its outstanding issue of 6 per cent. bonds to the value of $175,000. It is stated that the company has now an available cash balance on hand of $700,000, and it is expected that a first dividend at the rate of 10 per cent. per annum will be declared shortly.

Cobalt Townsite, Silver Mining (Ontario).—The following cable, under date May 1st, has been received at the London office: "Have made new discovery in crosscut to the north, the width of vein is 3 in. Assay results very satisfactory, 3,650 ozs. of silver per ton of 2,000 lbs. We have shipped to-day third carload 20 tons. May 3: third carload estimated value, $5,000. This is net after paying all costs (office note). This cable refers to the third shipment, viz., 20 tons of ore on May 1."

Crow's Nest Pass Coal (British Columbia).—The annual report of this company has been issued to shareholders, and contains the following information:

"The aggregate of the profit and loss account is $703,592. From this amount the directors have paid four quarterly dividends of 2½ per cent. each, making 10 per cent. for the year, and amounting in all to $350,000, and have carried forward to 1907 $353,592 to the credit of profit and loss account. The coal mined this year amounts to 806,901 tons, as against 831,249 tons mined in 1905. The production of coke amounted to 213,295 tons, as against 257,702 tons in 1905. The difference in production is due to the strike, which commenced on the 22nd of September and lasted for practically two months. Had the strike not occurred, and the average been maintained, the output would have reached the million-ton mark for the year."

Following is the income account, as compared with the two previous years:

	1906.	1905.	1904.
Balance previous year	$351,801	$203,320	$1,870,813
Net profits for year	351,791	497,899	406,049
Premium on new stock	.....	35,400	38,865
Total	$703,592	$736,619	$2,315,727
Dividends	350,000	349,418	348,427
Balance	$353,592	$387,201	$1,967,300
Reserve fund	.....	35,400	1,764,000
P. & L. surplus	$353,592	$351,801	$203,300

In an interview at Winnipeg, Sir William Mulock, referring to the recent strike at the Fernie collieries, pointed out that the

public had suffered great inconvenience in the past from labor disturbances in the coal areas, and in view thereof he thought some effort should be made to avoid like inconvenience in the future. This, he thought, might be done, by coal consumers in storing a reasonable supply in advance of actual requirements. For various reasons it is custom of the mines in the Crow's Nest region to mine coal only in sufficient quantities to fill the cars awaiting loading. If the supply of cars is restricted, mining ceases or is reduced; while, if at other times there is a surplus of cars, the mines are not always in position to take advantage of the increased facilities. In short, a hand-to-mouth policy has been pursued, with the result that any interruption in the supply has been immediately felt by the public.

NEW COMPANIES

The Sturgeon River Coal Company, Limited, Edmonton, Alberta.

The Galbraith Coal Company, Limited, non-personal liability, Lundbreck, Alberta.

The Southern Alberta Coal and Fire Clay Company, Limited, non-personal liability, Taber, Alberta.

The Bornite Company, Limited, capital $20,000, divided into twenty shares of $1,000 each, Victoria, B.C.

The Crown Coal and Coke Company, Limited, capital $2,000,000, divided into two million shares of $1 each. Head office, Spokane, U.S.A.

The Brown Alaska Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Seattle, U.S.A.

The Cobbler Sexton Mining Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Woodstock, N.B.

The Mississippi Cobalt Silver Mining Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Carleton Place, Ont.

The Giant California Mining Company, Limited, non-personal liability, capital $5,000,000, divided into fifty thousand shares of one hundred dollars each, Victoria, B.C.

The British Columbia Gypsum and Plaster Company, Limited, capital $100,000, divided into one thousand shares of one hundred dollars each. One of the objects of this company is to obtain mineral claims situate on the west side of Thompson River, opposite Spatsum, B.C.

The following company to operate in Canada was recently registered in London: Western Canada Investment Company, Limited; capital, £100,000, in £1 shares. Objects: To carry on an investment, financial, and agency business in Canada or elsewhere; to seek and secure openings for the employment of capital in any part of the world; to search for, prospect, examine, and explore mines and ground supposed to contain minerals or precious stones; to acquire, hold, dispose of, and deal with gold, silver, copper, lead, tin, quicksilver, iron, coal and other mines, mining, water, timber and other rights, etc. No initial public issue. The first directors (to number not less than three nor more than five) are: C. Bulkeley-Johnson, of Gladwood, Melrose, N.B.; R. D. Fordyce, Brucklay Castle, Aberdeenshire; and A. Partner, The Briars, Tolworth, Surbiton. Qualification, 500 shares. Remuneration as fixed by the company. Registered office: 24 Coleman St., E.C.

METAL, ORE AND MINERAL MARKET

Aluminium—No. 1 ingots, 41 cents per lb.
Antimony—22½ to 23 cents per lb.
Arsenic, white—7⅞ cents per lb.
Barytes, crude—$11.50 to $14.50 per short ton.
Bismuth—$1.40 to $1.50 per lb.
Cadmium—$1.40 per lb.
Carbon, for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 90 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$9.75 per short ton.
Fluorspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$15 to $30 per ton.
Lead—6 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 cents per lb.
Platinum, ordinary metal—$31 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump—10¼ to 11¼ cents per unit.
Quicksilver—$41 to $42 for 75-lb. flask.
Talc—$16 to $19 per ton.
Tungsten, pure metal—$1.25 per lb.
Tungsten ore, 60 per cent. pure—$400 per ton.
Tin—44 to 45 cents per lb.
Zinc sheets—$8.60 per 100 lbs.

MARKET NOTES.

Northern pig iron, No. 2 foundry, ranges up to $27 for quick deliveries.

Copper is still quiescent. Lake copper, 25 to 25½ cents per lb.; electrolytic, 24 to 24¼ cents per lb. The London market is less active; Standard, £102 3s. for spot.

Tin—New York, 44 to 45 cents per lb.; London, £189 per long ton for spot.

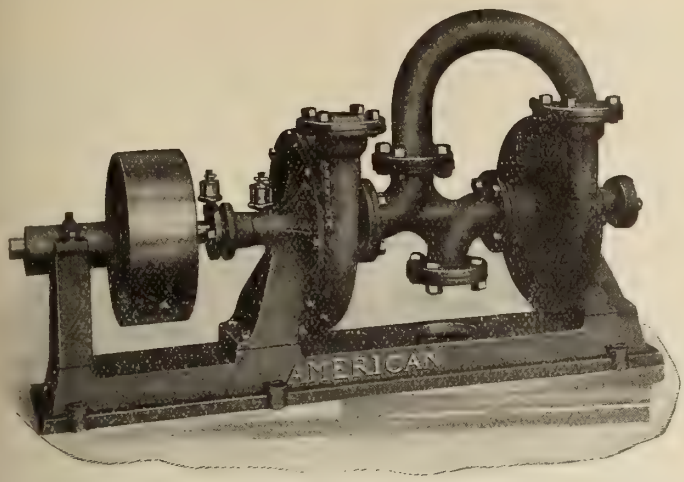
Lead—New York, 6 cents per lb.; London, £19 17s. per long ton.

Silver has advanced fractionally. New York, 65⅝ cents per ounce; London, 30 9-16 d. Mexican dollars, 50½ cents.

Spelter has declined—New York, 6.35 to 6.45 cents per lb.; London, £25, 17s. 6d. per long ton.

ELECTRIC STEEL

In a paper on the induction furnace, by Mr. Hermann Roechling, read before the Verein Deutscher Eisenhüttenleute recently, he refers to the experiments made at Voelklingen with two furnaces, one containing 50 to 60 kg. (110 lbs. to 130 lbs.), and the other 300 k.g. (660 lbs.). Alternating current of 50 periods was used. With the smaller furnace the power factor was very unsatisfactory; the figure given is 0.95. For the larger furnace no figure is given; it is said that the power factor is poor, but it is hoped to improve matters. To melt pig iron and heat it to about 1,200 degrees C. (about 2,200 degrees Fahr.), about 385 kw. hours per ton was required in the 300 kg. furnace. To complete a charge of scrap, about 600 kw. hours are required. The cost of this amount of electrical energy would be too high to render the process economical, and this is the reason why molten metal (instead of cold scrap, etc.) should be charged into the furnace, since in this way a considerable amount of electrical energy may be saved. By starting with molten basic or open-hearth steel, it is possible to refine the bath with a low expenditure of energy. For instance, at Voelklingen it has been found repeatedly possible to completely deoxidize ordinary molten basic steel and to remove sulphur and phosphorus down to mere traces and to recarburize the metal to 1 or 1½ per cent. of carbon and to finish the charge, with the total expenditure of 150 to 200 kw. hours per ton. With this expenditure it was possible to produce the finest sorts of crucible steel. If it is considered that this is possible with a furnace which contains only 300 kg. (660 lbs.), it is evident that with a larger furnace much better results may be obtained.



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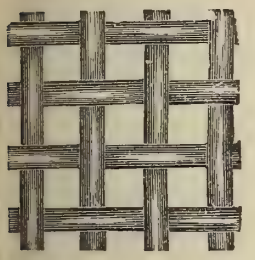
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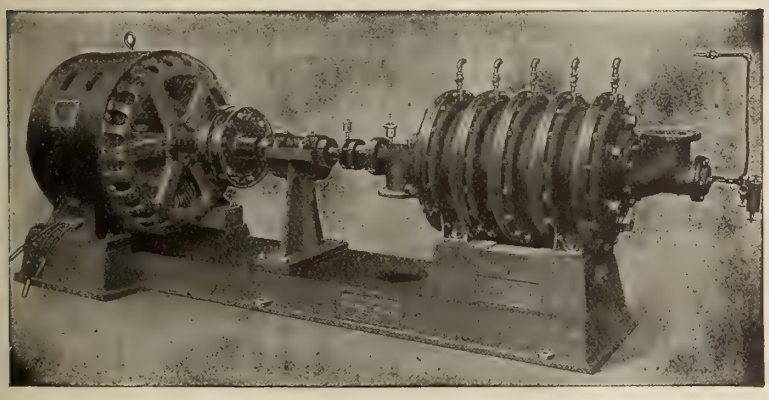
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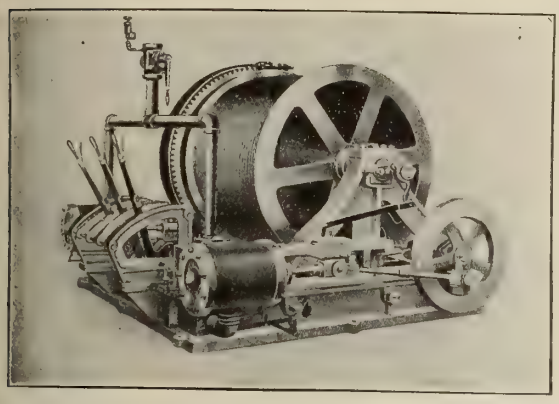
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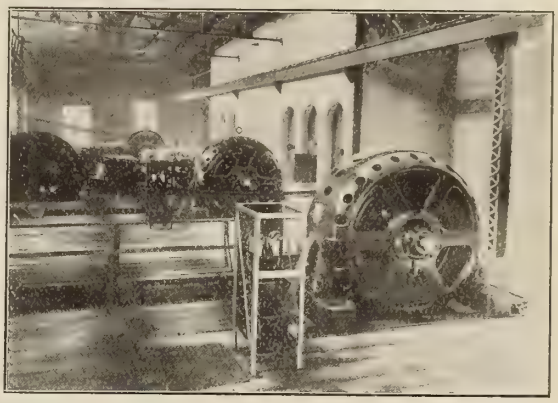
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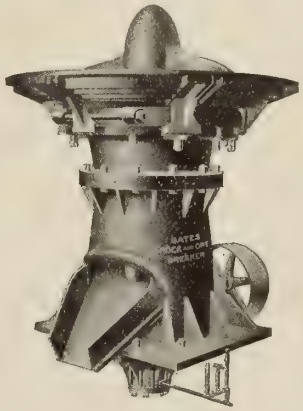
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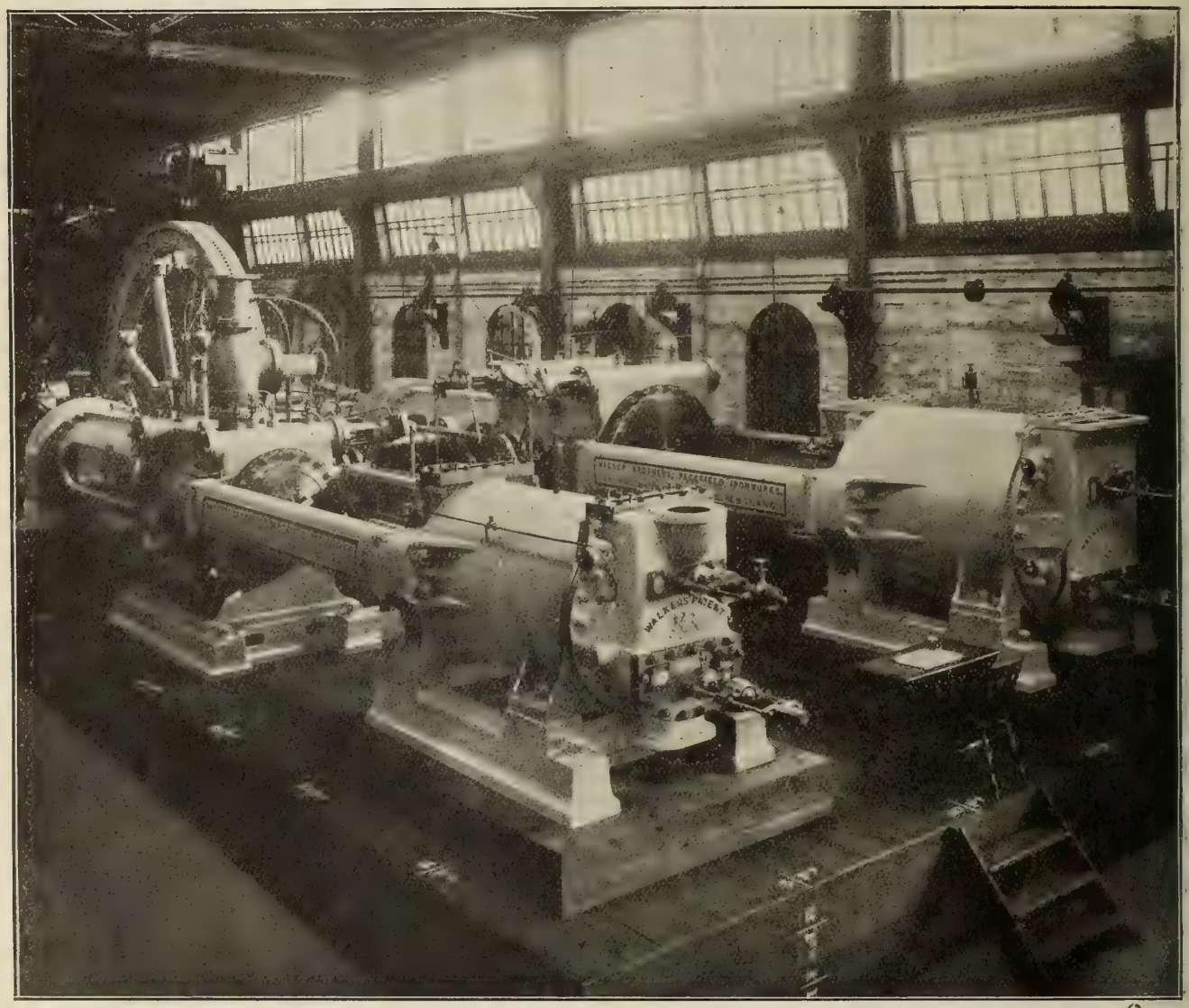
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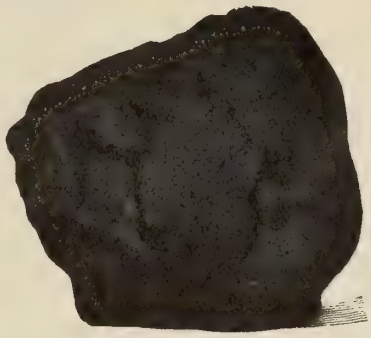
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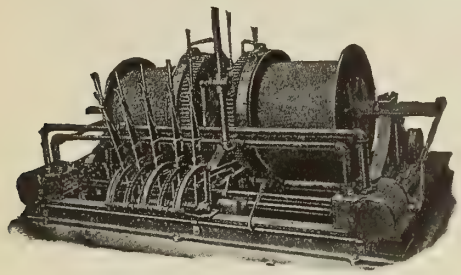
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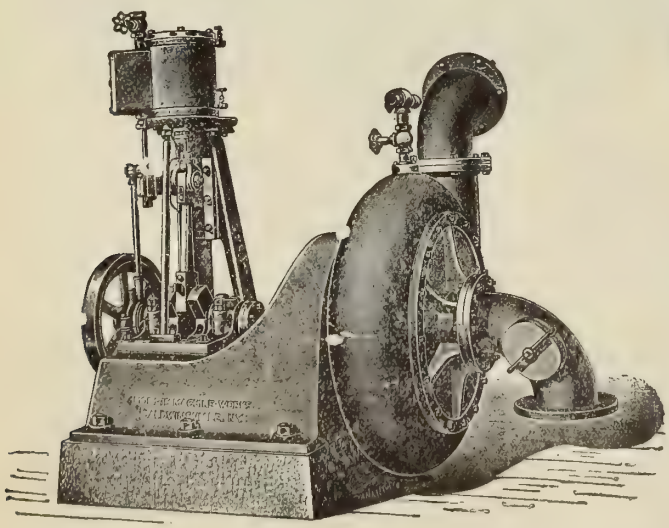
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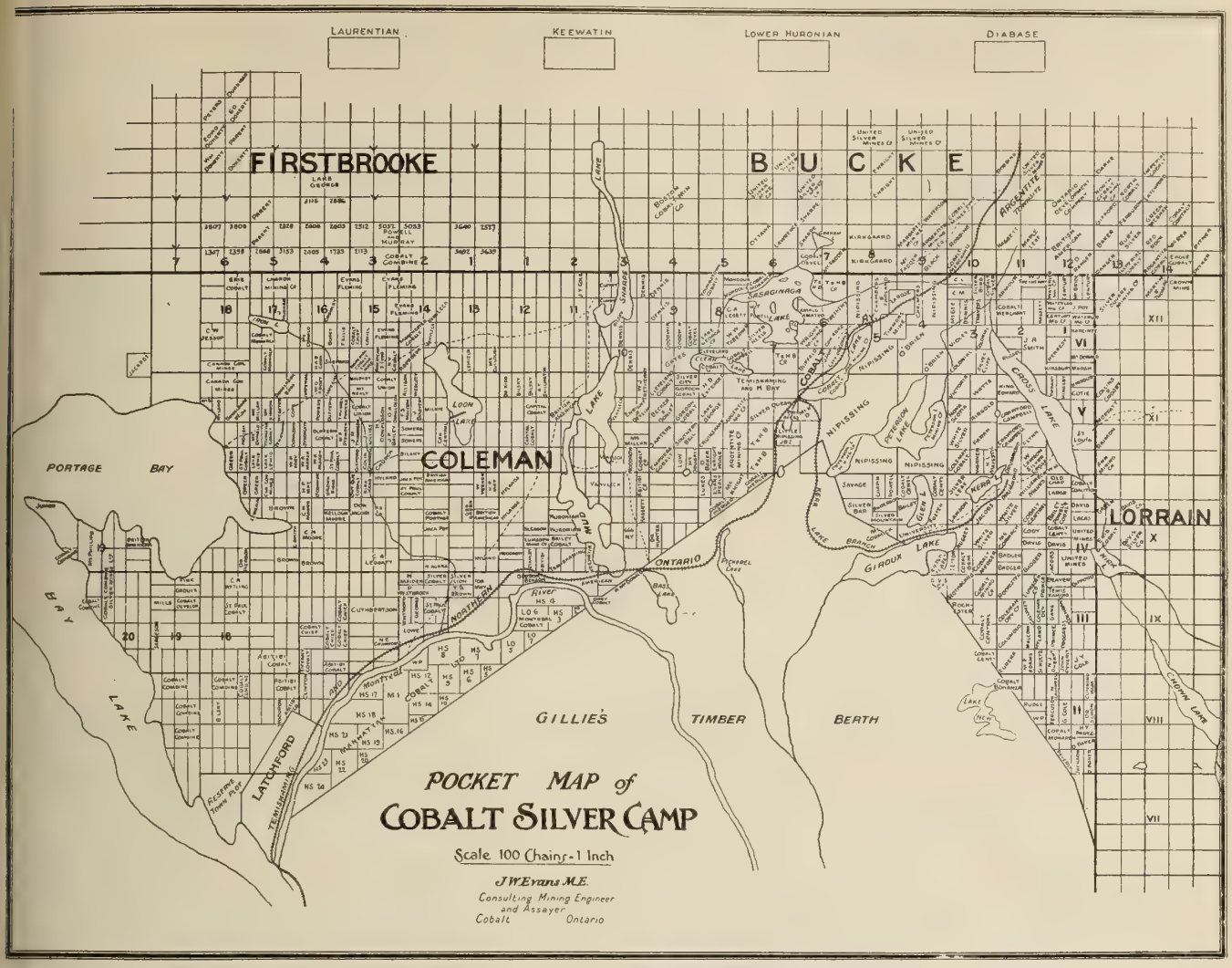
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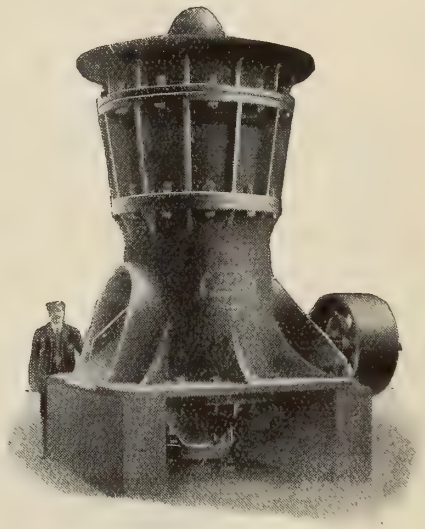
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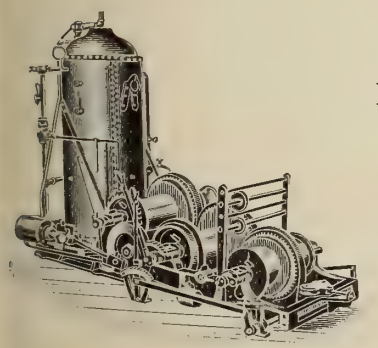
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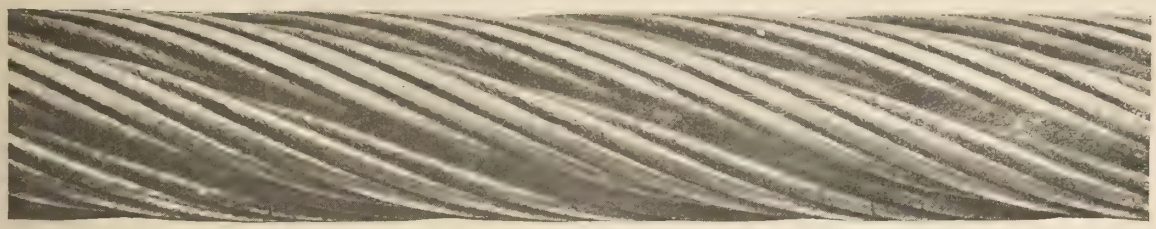


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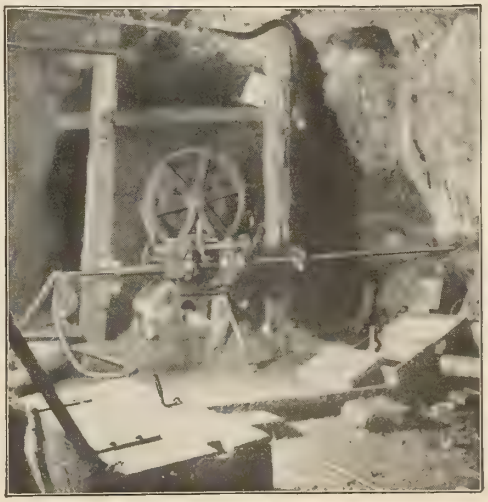
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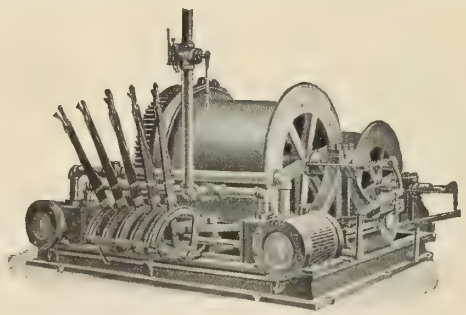
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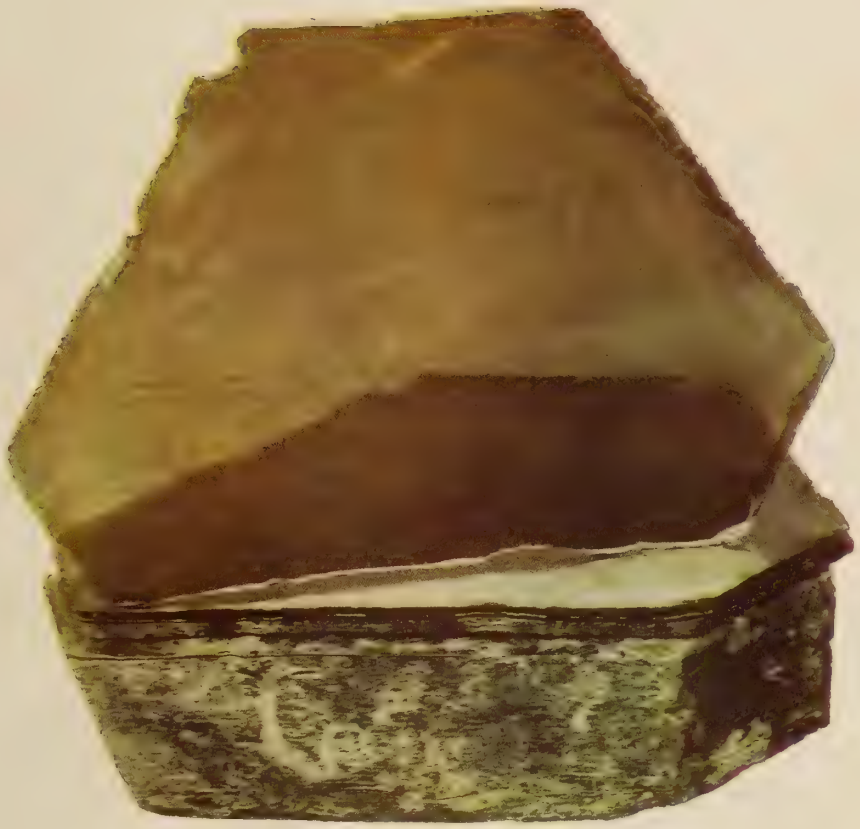
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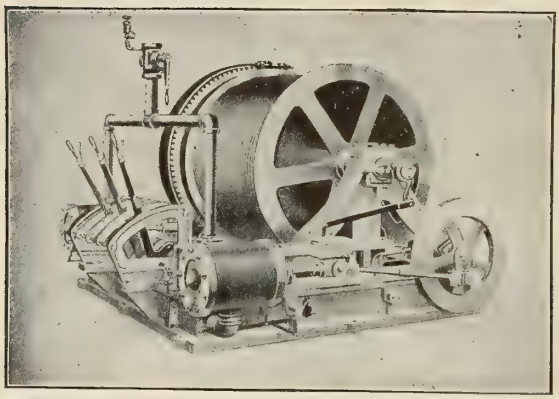
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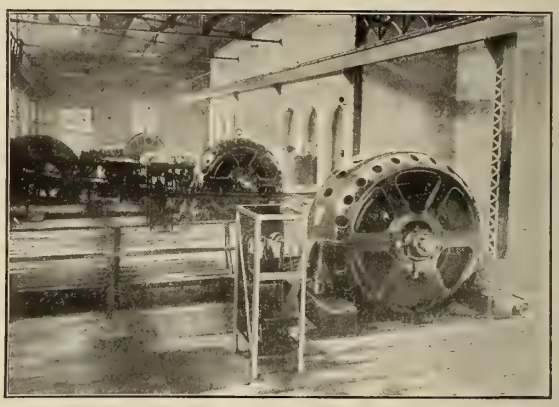
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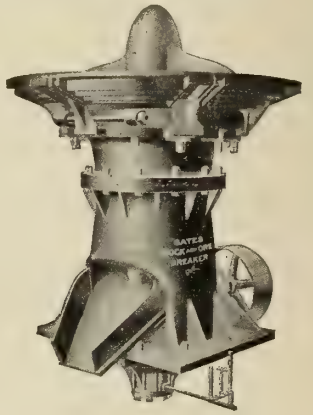
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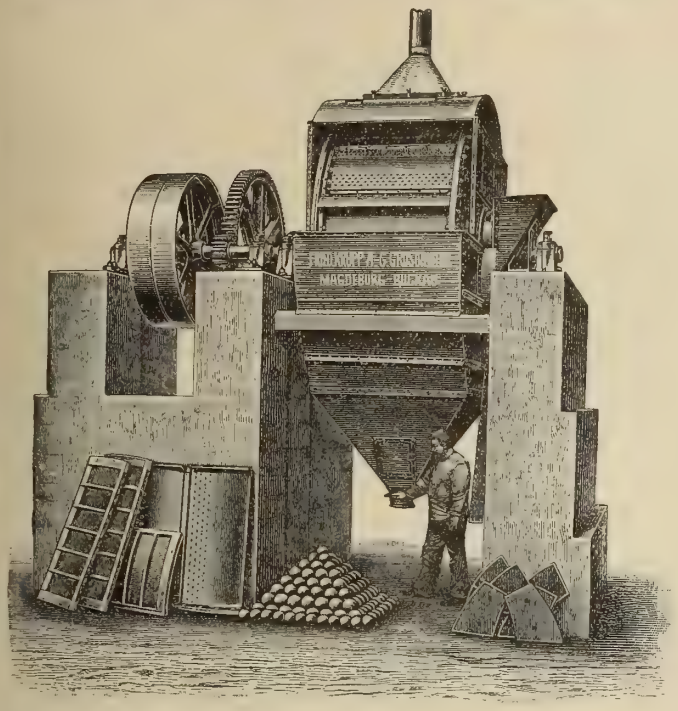
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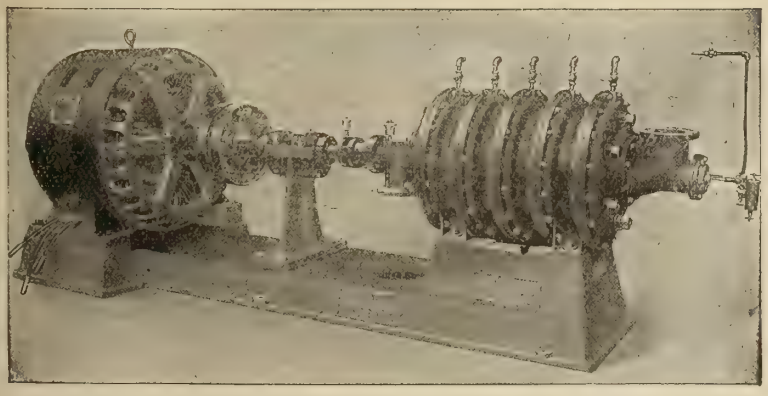
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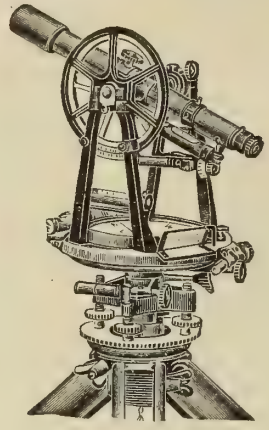
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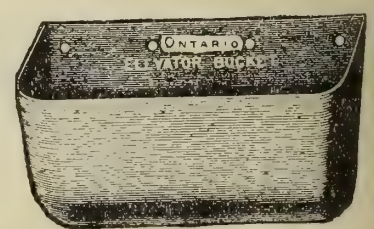
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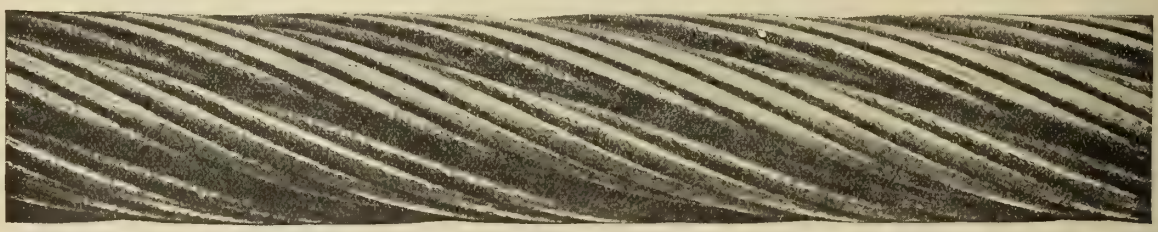


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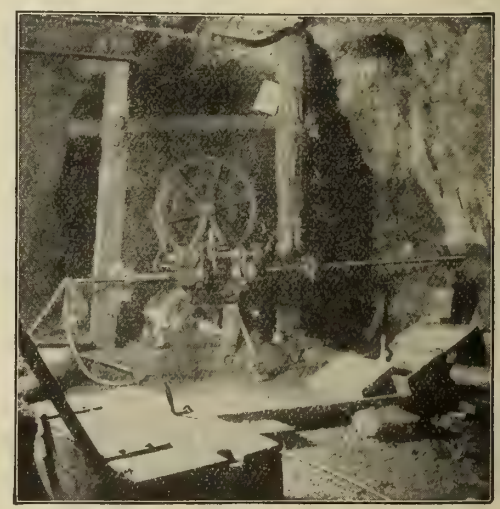
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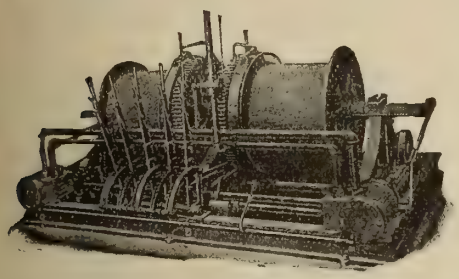
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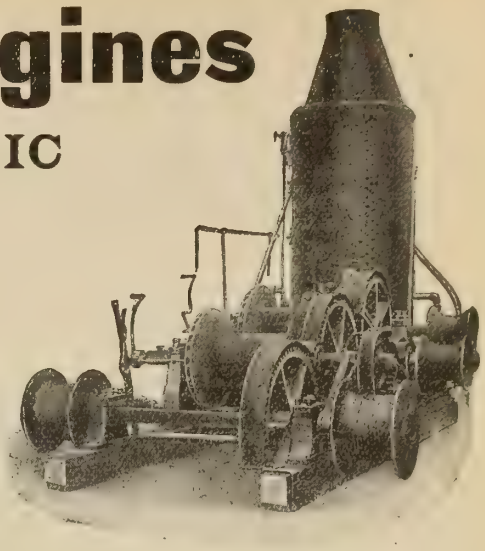
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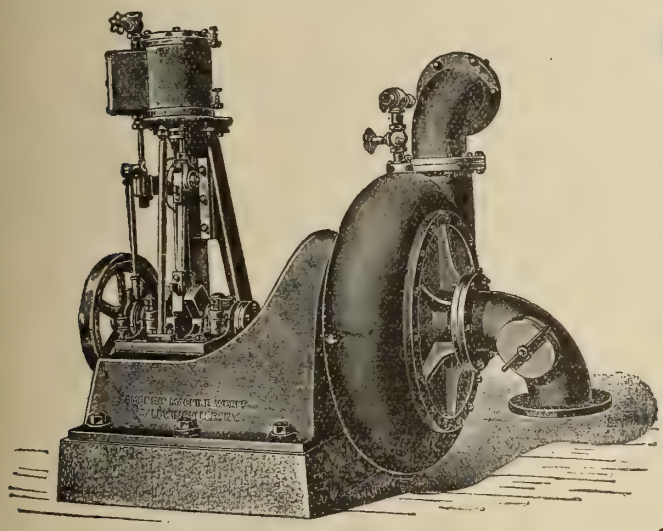
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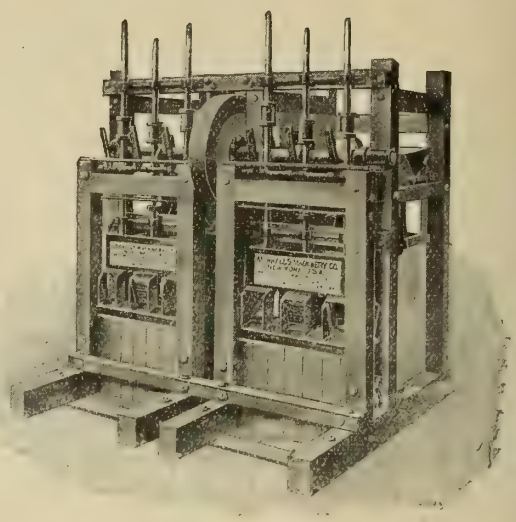
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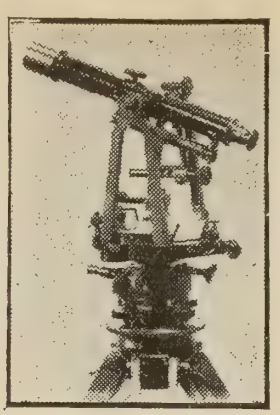
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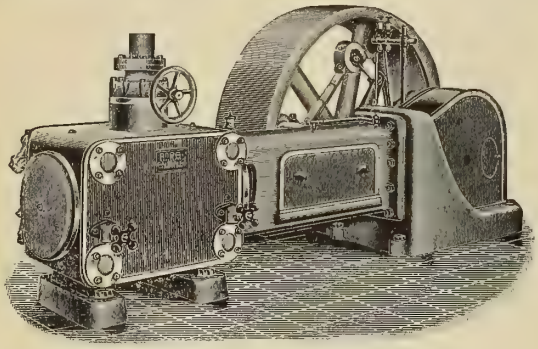
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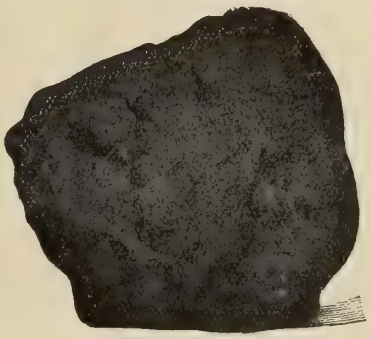
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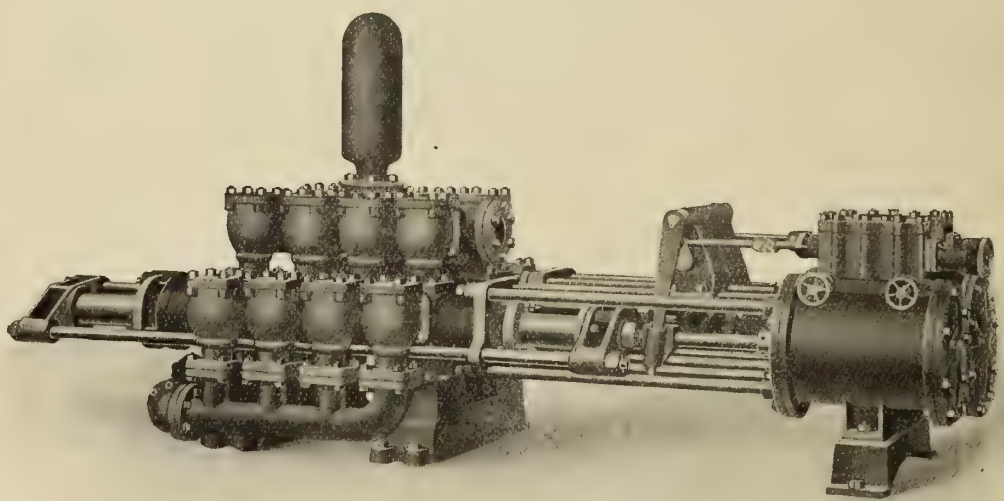
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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.
CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.
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COAL: Hon. Robert Drummond, Stellarton, N.S.
NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.
CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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A PICTOU COPPER SMELTER

The Dominion Mining & Smelting Company, of Pictou, Nova Scotia, is urging upon the Government and people of that Province the necessity of securing lower rates of transportation. There are several promising deposits of copper in Pictou, Colchester and Cumberland Counties. There are also more than a few totally undeveloped properties being held by persons who cannot afford to open them under the conditions now prevailing. The Pictou smelter is favorably situated as regards water shipments. It overlooks the splendid harbor of Pictou. The present capacity of the smelter is seventy tons of ore per day, making a forty-five per cent. matte. The average charge of treatment at the smelter is about $6 per ton for ore laid down at their wharf, or in the ore sheds by rail f.o.b. The company also offers to treat ores on the custom basis.

As a commercial enterprise, the Pictou copper smelter is decidedly worthy of encouragement. Concessions in the direction of nominal freight rates and active help from the Government in the development of individual properties should be offered cheerfully. The Provincial Government owns several diamond drills and has a Department of Mines. In what better work could the Department be engaged than in giving active assistance to the owners of copper properties. All of our important metallurgical industries have either started from very small beginnings or in their inception have met with serious obstacles. The soundest success is that resulting from a small beginning. It is altogether likely that Nova Scotia, by judiciously encouraging the attempt of the Dominion Mining & Smelting Company, will be taking the first step in establishing a successful and important industry of this nature. There is no need of injecting a large amount of capital. The smelter is already in operation. To keep it profitably employed, everyone at all interested in the copper possibilities of the Province should energetically push forward prospecting and development. And it is necessary always to bear in mind that rich returns must not be expected. The enterprise must be conducted on careful, business-like lines. Even though some time should elapse before a small margin of profit is obtainable, it must also be remembered that whenever a measure of success justifies the erection of a larger and more modern plant, the cost of operations can be very largely reduced. We hope that the Province will see and grasp its opportunity. We hope also that the Town of Pictou will substantially encourage what seems to be a most deserving undertaking.

READJUSTMENT

On the first day of June the holders of stock in the Trethewey Silver-Cobalt Mine, Limited, were officially notified that the directors had decided not to pay the expected quarterly dividend of 4 per cent. An explanatory letter from the president, Col. Alex. M. Hay, and a copy of a report upon the condition of the mine by Consulting Engineer Frank C. Loring, were published in the daily papers. The immediate effect of the directors' decision was a pronounced drop in Trethewey stock.

The Trethewey has already paid two quarterly dividends of 4 per cent. It is producing about 50 tons of concentrating ore per day, from which, according to Mr. Loring's estimate, a net profit of $500 per day, or $150,000 per annum, may fairly be counted upon. To insure a supply of high grade ore, development work must at once be undertaken. Further, there is a large amount, 6,000 tons, of low grade ore on the dump, and an indefinite quantity of similar ore in the mine, which, upon concentration, will, Mr. Loring affirms, yield a net profit of at least $10 per ton. To realize upon this ore a concentrator must be erected.

The cash available for both development and construction purposes is $60,000, represented by ore in transit and ore in sight or ready to be shipped. All of this ore is, of course, high grade. Mr. Loring, after reporting upon the amount of work actually done in the way of mining, demonstrates clearly the necessity of passing the current quarterly dividend and devoting the available cash to the purposes outlined above.

We heartily endorse the action of the new Board of Directors. The president's letter clearly states the condition of the company's affairs. Mr. Loring's report is lucid and forceful. Like many other Cobalt enterprises, the Trethewey Mine is laboring under a colossal capitalization. It will be impossible for the majority of them to satisfy clamorous shareholders and at the same time give the mine fair play. But the common laws of honesty and decency demand that the shareholders should know the exact state of their company's affairs.

ENGLISH MINING LABOUR

Our English contemporary, *The Colliery Guardian,* in commenting upon the report of the Miners' Eight-Hour Day Committee, shows that although the average time worked, bank to bank, in British coal mines on a day of full work is now nine hours and three minutes; still owing to voluntary absenteeism, the men now work 13.36 per cent. less time than their theoretical full time; which loss, if evenly distributed, would reduce the average working day to seven and one-quarter hours. "The final conclusions of the committee as to the possible effects of an eight-hour day are sufficiently definite," *The Guardian* continues, "to have raised a feeling of distrust in the minds of some who have been most ardent in their zeal; it is being realized that grave issues are plainly indicated in the report, for which no one would willingly claim responsibility." It is worthy of note that the committee found that the general health and physique of coal miners compared not at all unfavorably with those of any other class of laborers.

ELECTRIC SMELTING AND BRITISH COLUMBIA

The Victoria Daily Colonist urges upon the Federal Government the propriety of sending Dr. Haanel to British Columbia to investigate the possibilities of the extensive iron deposits of the west coast and of the abundant water powers. It may be stated, with a large degree of moral certainty, that within the next few years the electric smelting of iron ores will have become a commercial process. In sending a Commission to Europe to investigate the experimental electric smelters there, and in appropriating money for subsequent experiments at Sault Ste. Marie, the Federal Government acted wisely and well. It has put its hand to the plow. The energy and money already spent will be relatively profitless unless more energy and more money are at once directed to further investigation. No more promising fields offer than certain sections of British Columbia. Changed conditions may throw new light upon the whole subject.

QUEBEC MINING LAW

The evidence in the libel suit of Asselin v. Prevost, which has been in progress recently in Quebec, has very clearly demonstrated the weak points in the mining laws of the Province. Under the provisions of the law as it now stands, speculators are enabled to secure and tie up large areas of mineral territory in promising districts by the payment merely of the fees demanded for prospecting permits. Directly mineral is discovered in a new area these speculators rush to grab all the territory within miles of it, and, in consequence, the man with the pick, the legitimate prospector, who makes a business of searching for property worth developing, has in the face of such circumstances no chance whatever. Moreover, under this system undue temptation is put in the way of the Government employes in the Provincial Mines Department to show favoritism in mining permits.

One of the witnesses at the trial in question swore that he had been a victim of a clerk's mistake, although he did not say it was intentional, whereby land for which he had been the first to apply was granted to a later applicant. It is, however, an ill-wind that blows nobody good, and at least many of those who have taken advantage of the Act to secure large areas at a nominal figure have managed to make a very handsome thing of it, one gentleman admitting that he had "cleaned up" the snug little of sum of between "a hundred thousand and a million dollars" from the sale of his prospecting permits in one district alone in the last two years.

EDITORIAL NOTES

From figures compiled by the *Labor Gazette*, it has been shown that, with the exception of the professional classes, the wage-earners engaged in the mining industry in Canada receive higher average annual wages than any other class of workers. While the professional classes average $678.88, the miner averages $513.77.

Mr. A. P. Low is the new Deputy Director of the Department of Mines. Dr. Haanel is to retain his present position. Mr. John Marshall, formerly accountant of the Geological Survey, is to be account of the new department. The Deputy Director will still perform the functions pertaining to the office of Director of the Geological Survey.

A startling statement is made by a writer in a recent number of the *United Mine Workers' Journal*. He claims that, during the labor trouble in Colorado, a well-known detective bureau employed men to work their way into the labor organizations for the purpose of securing early information as to the plans of the unions. These spies, it is alleged, sent to headquarters exhaustive reports of the proceedings of the miners' meetings. In this way a great many of the strikers' plans were rendered abortive. It is sincerely to be hoped that employers of labor in Canada will never stoop to such degrading measures.

The Klondike River was free of ice early in May. Placer working and dredging have already been commenced in the Yukon. While this northern region has been favored with a remarkably early disappearance of ice and snow, Middle and Eastern Canada have suffered from an abnormally late and malignant spring. Adverse weather conditions have prevented and retarded prospecting and general development. On the Nova Scotia coast, late in May, pack ice from the north blocked North Sydney Harbor and caused a short though very vexatious delay in coal shipments. Already the fuel shipments from Nova Scotia to St. Lawrence ports are far below the figure attained at corresponding dates of last summer.

In this number of THE CANADIAN MINING JOURNAL will be found an article on the Boston-Richardson Gold Mine. This Nova Scotian mine is working profitably a very low grade gold ore. It affords a very striking example of the benefits of the application of common sense and modern methods of mining and ore reduction and concentration. In these respects it stands out prominently against the dark background of failure, incompetency, mismanagement and ill-fortune that so characterizes the gold industry in Nova Scotia. It is encouraging, however, to notice that in several districts the same methods are producing the same cheering results. Nova Scotia's gold mines need and must have competent, careful management.

Authorities appear to agree in the view that not only will the present high price of copper be maintained, but that there is every likelihood of a marked advance within the next six months. This belief is based on several apparently sound reasons, of which may be mentioned the recent falling off in output, the restlessness of labor in many of the large copper mining centres of the United States, Canada and Mexico; the relatively limited available supply of the metal for immediate delivery, and the increased demand from Europe. The *London Financial News*, reviewing the copper situation, points out that whereas sixteen years ago the world's visible supply represented 25 per cent. of the yearly production, at the end of 1906 it was only 2 1-2 per cent.; and, allowing for the natural increase in the world's output for this year, in the month of April, barely 2 per cent., or just sufficient for a week's supply.

The Dominion Government has announced that it will shortly publish a report upon the mining industries of Canada. This is most commendable. If suitable appropriations are made and capable men engaged, the report should be a very valuable work of reference. The Dominion Geological Survey and the Mines Department have done a great deal towards diffusing information about Canada's mineral wealth. So also have the Mines Departments of Ontario, British Columbia, Nova Scotia and Quebec. But although a large amount of valuable information has been published from time to time, it is so scattered as to be of very little practical use. It is also true that only the fringe of Canada's possibilities has been touched.

To collect, redact and condense all available published information touching the mining industry of Canada would be a heavy task in itself. If it is intended to bring this up to date, and to do more than merely indicate the country's undeveloped resources, then there will be required the continuous services of a large staff of experienced specialists, over a long period of time.

We are informed by Mr. H. Carnegie Williams that his company, the Copper Mining & Smelting Company of Ontario, has ordered and is soon to install one trial unit of the Elmore Vacuum process ore concentrator at their Bruce Mines plant. One unit has a capacity of 40 tons per day. As the company's mill requires 400 tons per day, a considerable installation will be required if the trial unit proves satisfactory. The company's consulting engineers, Messrs. Pellew-Harvey & Fell, of London, England, inspected Elmore installations in Cornwall, and reported very favorably upon them. Waste dumps, containing from 0.65 to 0.76 per cent. of copper, associated with other minerals, are being treated. An actual recovery of 90 per cent. of this copper is reported. As the Bruce Mines ore is a clean chalcopyrite, and as the old waste heaps, amounting to 120,000 tons, carry 1.15 per cent. copper, the Elmore

process should be most readily applicable. Indeed, experiments carried on by the inventors on samples of Bruce Mines ores have shown a saving of 93.5 per cent. of the values. One need not be a confirmed optimist to hope for great things from this new process.

An article entitled "Some Facts About Cobalt" appears in the issue of *Canada* for May 18th. While the writer of the article in question is perfectly justified in warning the British public against investment in some of the prospectusless Cobalt undertakings which are now being floated in London, he goes to extremes in stating that Cobalt's record for the last twelve months is unsatisfactory. The writer also attacks a recent Canadian promotion and stigmatizes as an extravagant falsehood, "sufficient to destroy all confidence in the company or its directors," a statement of one of the promoters that in one of the company's mines ore to the value of three millions sterling had been blocked out above the one hundred foot level. As many of our readers know, this particular statement is strictly within bounds and is vouched for by no less an authority than Professor Miller. As to the Cobalt district, though doubtless many worthless properties have been foisted on the public, there is probably no mineralized area in the world, of like extent, comparable in point of richness of silver values; nor are we aware of any silver camp which in so short a time has equalled Cobalt's record in the matter of output or dividends. In short, there is no mining district in Canada where it should be a matter of so little concern whether British capital is invested there or not.

The reports of the Mines Inspectors for 1906 for the Newcastle (England) District shows that approximately 28,000,000 tons of coal were raised during that year. Beside 347,162 tons of fire-clay, small quantities of ironstone, brick shale and ganister were mined. For five successive years a record output of coal has been raised in the district. Among permitted explosives used in the collieries, Bobbinite stands at the head, 281,808 pounds of this explosive having been used. Saxonite ranks next, with 206,567 pounds In other explosives, gunpowder has 3,256,687 pounds to its credit. The disc class of coal-cutting machine has precedence in this district over others, and compressed air is used as motive power more extensively than is electricity.

In the west of Scotland district, 18,897,278 tons of coal were raised, fire-clay 492,350, and ironstone 727,158. It is true, also, in this district, that the disc coal-cutting machine is by far the most popular, and compressed air is the favored motive power. After gunpowder, gelignite is more extensively used than any other explosive.

Yorkshire and Lincolnshire are credited with 32,547,905 tons of coal, all of which comes from Yorkshire. The same remarks about the disc coal-cutter and motive power apply again. A great variety of explosives are used in this district. Bobbinite comes first, with gunpowder a close second. The Marsant safety lamps, fitted with lead rivet locks and burning colza or colza mixed with paraffine, are most largely used.

MICA IN ONTARIO

By E. T. CORKILL

The mining of mica in Ontario dates back to about the year 1860, when a quantity of large and carefully selected sheets from lot 17, in the ninth range of the Township of North Burgess was sold in Paris for the use of the French navy, at a price of $2 a pound. Some of this mica was in sheets twenty inches square, or larger. At this time, 1860, and for the following thirty years, mica was used chiefly for stove fronts, lanterns, lamp chimneys and also instead of glass in the windows of ships of war. to save breakage from concussion. The production of mica from the sixties until the beginning of the nineties was chiefly as a by-product of apatite. These two minerals are very intimately associated, and during that time there was a large trade in apatite, with a rather small demand for mica, and then only for the large sizes. As a result the deposits were all worked for apatite, and the mica was simply a by-product. Between 1890 and 1895 mica, particularly phlogopite, or amber mica, was first used in the electrical industry, which gave an impetus to the industry in Ontario. Prior to the time the small sizes of mica had not been marketable, thus this new industry created a market for a size of the material of which a large quantity had already been mined and thrown away as useless. This has, therefore, been re-sorted, and the small sizes previously thrown away saved and marketed. The sizes of amber mica now asked for by the buyers, and the approximate price which the cleaned mica will bring, are the following:—

1 in. x 2 in.....	5-6 cents	per pound.
1 in. x 2 in.....	10	"
1 in. x 3 in.....	20	"
2 in. x 3 in	45	"
2 in. x 4 in.....	65	"
3 in. x 5 in.....	75	"
4 in. x 6 in.....100		"

Mica, on account of its peculiar characteristics, has a wide field of usefulness. Its elasticity, non-conductivity and infusibility make it a mineral particularly adaptable for use in insulating armature slots, armature magnets, commutator cores, transformers, etc. A great many artificial substitutes have been tried, but none have been found as yet that have been satisfactory. In Ontario all the mica mined at the present time is phlogopite, or the amber mica of commerce. This mica is used almost exclusively in the electrical industry. A small quantity only is used in manufacturing lamp chimneys, for lights for windows, in stoves and peep holes in furnaces, which enables the operator to watch the process without suffering from the intense heat. Micanite has become an important factor in the

utilization of the small sizes of mica as 1 x 1, 1 x 2, 1 x 3 and 2 x 3, by being cemented together by the aid of a cement as shellac. After the mica has been built up into these plates by means of the shellac, it is put into steam presses and baked and steamed at the same time.



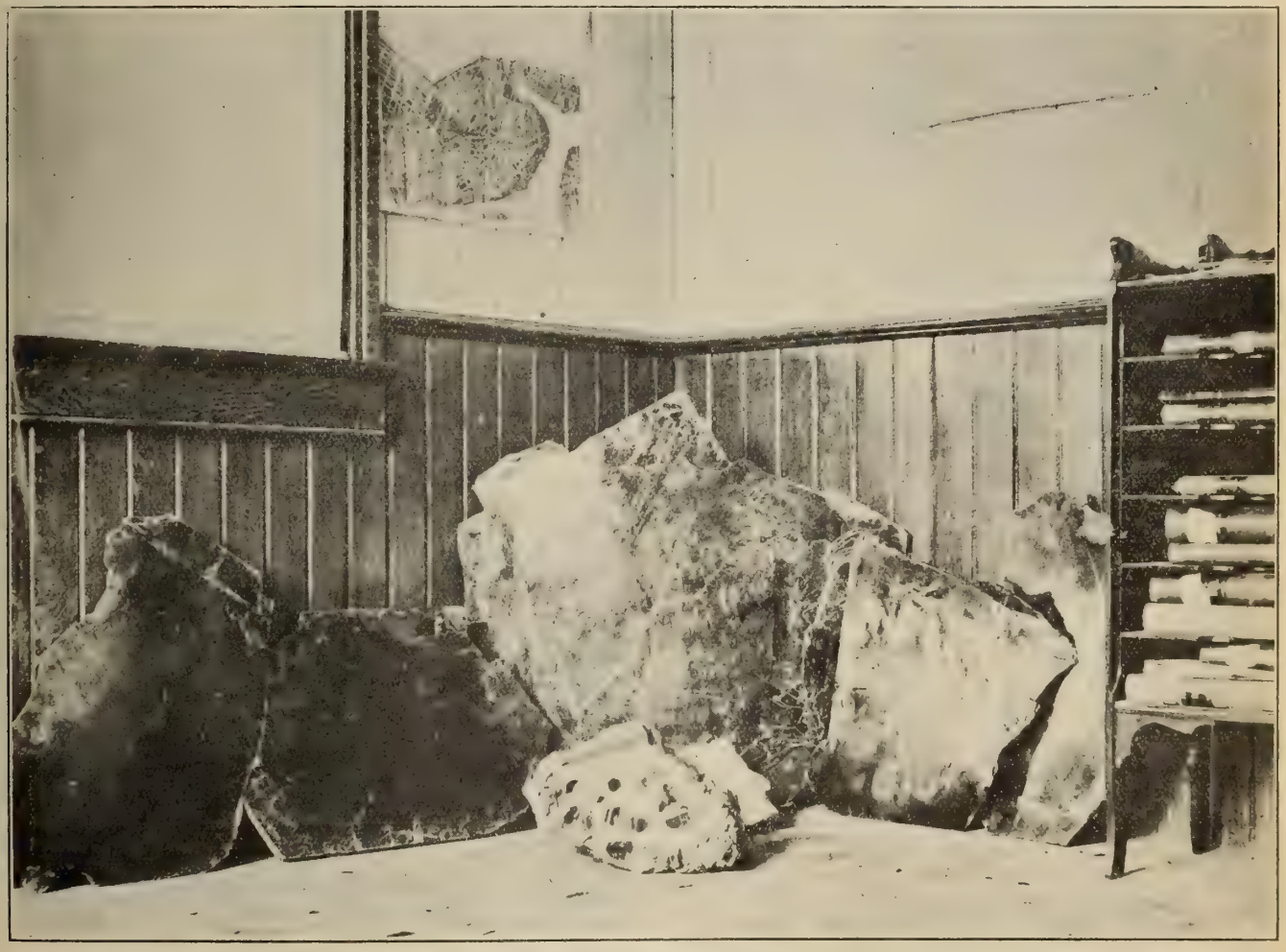
CRYSTAL OF MICA

All the properties of the shellac, excepting the cementing quality, are supposed to be eliminated in this process, so that the insulating qualities of the plates are not reduced or lowered. After being baked and pressed, the plates are milled for the purpose of making them smooth and even. They are then sawn into segments. If it is required to make rings, etc., out of this plate, they are made by steaming the micanite to the shape required. Another use for mica that is coming more into prominence is the use of the scrap mica for boiler and pipe covering. This has proved very efficient whenever used. The scrap mica is also used when ground and mixed with oil as a lubricant.

Mica, as referred to above, was first mined in the Township of North Burgess, County of Lanark, in the early sixties. Since that time, this township has proved to be one of the most productive sections of Ontario. The other most productive mica area in Ontario is the Township of Loughboro'. These two townships of North Burgess and Loughboro' have produced more than fifty per cent. of the total production of Ontario.

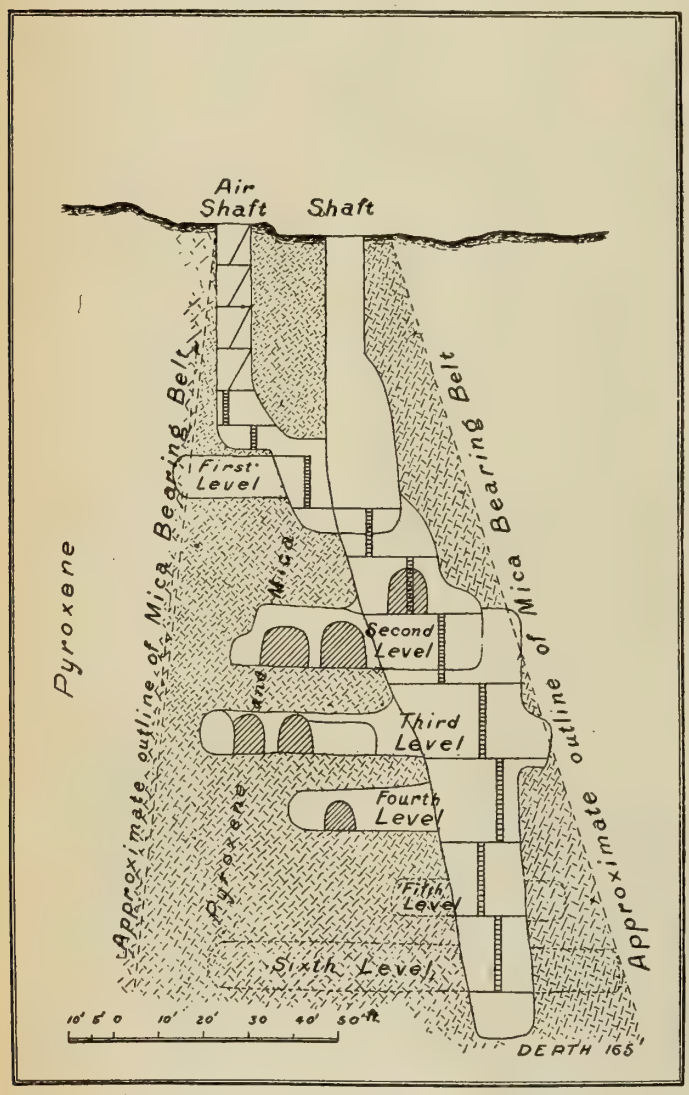
Phlogopite, or amber mica, occurs in the granitic and gneissic rocks of the Laurentian. The southwestern end of the amber mica-producing section is in Loughboro' Township, Frontenac County. From here, south and west, the Laurentian is overlaid by the limestone of Silurian age. On lot 11, concession 7, Loughboro' Township, is situated the Lacey Mine, which has proved a very steady producer and has probably produced more mica than any other property in the Province.

The first work was done on what has since been known as the Lacey Mine in 1884, when a shaft was sunk on the vein. This was owned at that time by Messrs. Smith and Lacey, who took out a large tonnage of an exceedingly good grade of mica. The pit was sunk to a depth of about 130 feet, and vein stoped out for a distance



SPECIMENS OF ONTARIO MICA

of about 130 feet along it, with an average width of vein of from 10 to 15 feet. This pit was abandoned in the early nineties, and the mineral right of the lot sold to the General Electric Company of Schenectady, N.Y. In 1899 a new discovery of mica was made about 200 feet southeast of the old workings. This has been worked continuously since that time and has been a large producer. It has been worked to a depth of 185 feet and longitudinally over 200 feet. The vein in some places is 20 to 25 feet in width. On the first level at a depth of 60 feet the drift has been run southeast on the vein a distance of 175 feet. On the fourth level at a depth of 117 feet two drifts run southeast, the easterly drift being 150 feet and the westerly drift 135 feet in length. Northwest of the shaft the mica has been stoped



Vertical Section of Lacey Mica Mine, Sydenham, Ont.

out for a distance of about 50 feet. On the second level a cross-cut has been driven a distance of 55 feet to cut a parallel ore body, which thus lies between the old and new workings. This body is about 75 feet in length, 60 feet in depth, and has an average width of about 8 feet.

The mica, which is a phlogopite, occurs in a vein matrix of calcite and pyroxene. The phlogopite is well crystallized, sometimes occurring in crystals 6 feet in diameter, and sometimes 4 to 5 feet in thickness. The wall matter surrounding the vein is essentially a mica pyroxene schist. The bedding of this rock cuts the vein at right angles. This is very marked on the fifth level of the mine, where the bedding occurs at an angle of about 20 degrees from the vertical and at right angles to the vein.



Lacey Mica Mine, Sydenham, Ont. Operated by the General Electric Co.

The mine is well equipped with two 60 horse-power return tubular boilers, six drill compressor and hoist.

About three miles from the Town of Elgin, on lot 7, in the 6th concession of Bastard Township, County of Leeds, the Brockville Mining Company are working a property which is of interest in that it occurs some distance from any other workable deposit, and also the mode of occurrence of the mica is different. The mica is a very dark amber, almost verging into a biotite. The vein is about 4 feet in width and dips at 30 degrees to the horizontal. The vein material is composed, as usual, of calcite and pyroxene, with the mica crystals, being crystallized throughout. The main difference between it and the larger mica deposits in the Province is that there is no (what the miners term) mica rock lying along each side of the vein. This mica rock is generally a mica pyroxene schist, which occurs between the vein and the granite or granite gneiss. At this particular deposit the vein cuts the country rock, which is a very dark hornblende granite, thus leaving the mica crystals lying right against the granite. On account of the hardness of the rock, the mica has been crushed considerably



Mica Mine near Elgin. Owned by the Brockville Mining Co.

on crystallization and the vein is more liable to be in the form of lenses.

The Hanlan Mine, situated on lot 11, in the 6th concession of North Burgess, is probably the best example of a true fissure vein of any amber mica mine in the Province. Here the vein has been mined for a depth of 120 feet, and a length of about 200 feet, without a break in it. The vein is quite uniform in width, averaging about 6 to 8 feet, while in some places it widens out to about 15 feet. The vein matrix, as is usual, consists of calcite and pyroxene, with occasional pockets of apatite. The mica in parts is well crystallized, while in adjacent parts it is quite badly crushed. The wall rock is a mica pyroxene schist, but not enough work has been done cross-cutting this to show whether there is any distinct bedding. In other respects it is quite similar to the corresponding mica pyroxene schist at the Lacey Mine. This vein strikes east and west, cutting the granite gneiss of Laurentian age, and dips to the south at an angle of about 75 degrees to the horizontal.

As an example of a deposit where the apatite predominates in the vein matrix, I shall briefly describe the mine known as the Smith Mine, owned by the Dominion Development & Improvement Company. This mine is situated on the east half of lot 13, in the 5th concession of North Burgess, and was originally opened up as a producer of apatite. After a pit had been sunk about 25 feet on the vein, mica crystals were found through the apatite. The apatite is soft and granular, thus giving the mica a favorable matrix in which to crystallize out freely. The vein in some places is 10 feet wide, consisting of apatite, calcite and mica. The vein dips at an angle of 50 degrees to the horizontal. On each side of the vein we find a mica pyroxene schist some few feet in thickness, which in turn cuts through the granite gneiss. This belt of mica pyroxene schist can be traced for some distance along the surface, where at different places a little mica has been taken out. The association of the pyroxene rock with the mica veins is very marked over the whole mica area. In fact, it is very rare to find a large, healthy deposit unless it is enclosed by this rock.



FINISHING HOUSE—LACEY MINE, SYDENHAM.
Operated by the General Electric Company.

At the present time the preparation of the mica for the trade has created quite an industry in Eastern Ontario, especially in Ottawa, which is quite favorably situated as the centre of the mica-producing sections of Ontario and Quebec. In Ottawa two of the large consumers, The Laurentide Mica Company (Westinghouse) and The General Electric Company, have built factories in which they employ from 500 to 600 girls in the preparation of the mica for the market. The preparation consists of cleaning or breaking off all the ragged or broken edges of the run of mine crystals, and splitting it down to about one-eighth of an inch in thickness, and grading it to the different marketable sizes.

This is then knife-trimmed and taken to the tables for thin splitting. The chief and essential characteristic of mica is its highly perfect basal cleavage, permitting the mineral to be split exceedingly thin. This characteristic is made use of in thin splitting. The purpose of the mica being thin split is to enable it to be built up into what was described above as micanite. Most of the mica mined in Ontario is shipped to the United States.

Canada has for some years been the second largest producer of mica in the world, India producing the greatest tonnage. The India mica is all white mica, or Muscovite, of which quality of mica Ontario produces none, although we have some pegmatite veins containing white mica, which have been but little explored.

Canada can thus be said to rank first in the production of phlogopite.

THE MARBLE BAY COPPER DEPOSIT

BY O. E. LEROY.

(By permission of the Director, Geological Survey of Canada. Toronto meeting, 1907.)

INTRODUCTION.

During a reconnaissance survey of part of the southern coast of British Columbia, in the summer of 1906, the writer had an opportunity of examining briefly the ore deposits occurring on Texada Island. One type of deposit is of particular interest, both on account of its being in a contact metamorphic zone and of its economic importance in containing valuable ores of copper. These deposits have previously been described in the reports of the Provincial Mineralogist, and in several papers by Mr. W. M. Brewer. In his later papers Mr. Brewer has drawn attention to certain deposits occurring on Gribbel Island, and in the White Horse District, Yukon Territory*, and shows that in mode of occurrence they are very similar to those on Texada Island.

The object of this paper in describing an example of this type is to again emphasize the economic importance of these deposits lying in widely separated areas, and to show that they are worthy of the careful consideration of those interested in mining.

GEOGRAPHICAL POSITION.

Texada Island, named by Elsa in 1791, lies in the Strait of Georgia, its south-east end being about 80 miles north of Victoria, and 47 miles from Vancouver. (See Fig. 1, Inset Map.) The town of Van Anda, where the chief mines are situated, is about 75 miles from Vancouver, and is a port of call of the Union Steam Ship Company. The island has a length of 30 miles with a maximum width of 6½ miles. High and mountainous throughout, especially in the eastern half, where Mount Shepherd attains a height of 2,900 feet, it presents to the observer when viewed at a distance the appearance of part of a submerged mountain chain. The shores are very rugged, with bold cliffs fringed in part with narrow boulder beaches. Sand and gravel beaches are few and there are only three harbors, Marble, Gillies and Blubber Bays, the two latter being somewhat exposed in certain winds.

GENERAL GEOLOGY.

The island is underlain by the Vancouver series of Dawson, part of which has been referred to the Triassic. There seems, however, to be an entire absence of fossils in the associated limestones, and part, if not all, of the series may belong to the Paleozoic era. The series admits of two divisions. The lower is composed of chlorite and hornblende schists, tuffs, amygdaloidal lavas, porphyrites and agglomerates which show over small areas obscure bedding. The upper division consists of limestone, which varies from a massive thick bedded unaltered rock to a fine grained pure white marble.

Subsequent to the deposition of the limestone there was considerable volcanic activity, and the whole of the Vancouver series was much disturbed by intrusions of diorite, gabbro, hornblende and augite porphyrites and diabases. The relations of these rocks with the limestones are well seen where they have intruded as dykes, sills and irregular masses faulting, and marbelizing the latter.

These igneous rocks, both older and younger than the limestones, have been much altered, and a large proportion of their present mineral content consists of secondary epidote, magnetite, chlorite, pyrite and calcite. They are widely developed and underlie the greater part of the island. The limestone, with the exception of a few small outliers, appears only at the north-west end, where the exposure has a length of 7½ miles, with a maximum width of two. In upper Jurassic times extensions of the great Coast Range batholith, consisting of granites and syenites, penetrated this older series and had a profound effect on them, producing schistose structure and shear zones in many of the igneous rocks, and converting the limestone to various crystalline types along with widespread faulting as the discordant strikes and dips now show.

The coast batholith was followed by a great series of basic dykes, principally diabases, and all the older rocks have been cut by them.

The Cretaceous has a limited exposure at Gillies Bay, consisting of feldspathic sandstones with calcite cement. The beds are probably basal, and are but slightly disturbed with low dips to seaward.

During the Glacial Period the island was eroded by the Strait of Georgia Glacier. A thin mantle of drift covers certain areas composed of sandy boulder clay, the boulders being principally varieties of granite from the main coast.

In the general depression which followed the island was much reduced in size, being some 400 feet lower with respect to sea-level than at present.

ECONOMIC GEOLOGY.

In the early nineties attention was first called to the occurrence of free gold in quartz veins, and later, deposits of rich copper sulphides were found in the limestone. These latter were not considered of any great importance at the time, but subsequent development has proved the contrary. Both divisions of the Vancouver series contain valuable ore bodies, which are found in the eruptive rocks, at their contact with the limestone, and in the limestone.

In the eruptive rocks, the ores occur in shear and fracture zones with quartz and country rock gangue.

Much movement is shown by the slickensided walls, and later cross fractures are filled with calcite. The ores are galena, zinc blende, copper and iron pyrites carrying as a rule low values in gold and silver. The ore is also very pockety, and solid ore alternates with barren zones. The width of the veins varies from 2 to 4 feet, and one mine only, the Surprise, has been proved to a depth of 360 feet. Other veins contain pyrite chiefly and have been noted for the rich showings of free gold in quartz. These, unfortunately, were only surface enrichments and had no depth, the pyrite immediately below being practically barren.

Contact deposits between the various igneous rocks and the limestone, include the large and important bodies of magnetite situated on the south side of the island and owned by the Puget Sound Iron Company. On this property there is also a series of copper deposits—chalcopyrite and carbonates—along the contact of the limestone with the altered porphyrites or the magnetite. The ore occurs in rudely lenticular bodies lying at various angles from vertical to horizontal, the limestone being almost invariably the hanging wall or roof.

The important deposits of bornite and chalcopyrite, to which particular reference will be made, are found wholly in the limestone. At present two mines are being worked—the Marble Bay and Cornell. The Copper Queen, which was the pioneer mine of the district, is lying idle. (Fig. 1).

THE MARBLE BAY MINE.

In 1897, an insignificant outcrop of copper and iron pyrites with some bornite was found a quarter of a mile east of Sturt Bay, on a Crown-granted lot, owned by Messrs. Christie and Palmer, of Toronto. A shaft was sunk on the ore and drifts run, but it was not until the 260-foot level was reached that the ore body assumed a definite character.

In 1902 the property was purchased by the Tacoma Steel Company for $150,000, and it was extremely gratifying to the company to have been able to pay the whole of the purchase price in three years out of the profits earned by the mine. The mine is now 760 feet deep and 715 feet below high tide. The ore body from the 260-foot level to the present workings has varied in length from 75 to 115 feet, and in width from a few inches to 45 feet. On the first floor of the 760 level, it is 87 feet long with a maximum width of 32 feet.

From the 140 to the 560 level the ore body pitched north at a high angle, but from there to the 760 it is practically vertical.

From the data collected this deposit may be described as an ore chute, occurring in a zone of brecciation in the crystalline limestone, this zone being approximately parallel to the strike. Divided into subordinate chutes above the 360 level, it has, below that, been continuous. The borders are broadly irregular, and small stringers are given off which run a few inches into the country rock. In the upper levels the walls were brecciated and weak, but in the lower they are firm, and very little work is necessary in the way of lagging. The ore is bornite with subordinate chalcopyrite, and a little pyrite, pyrrhotite and molybdenite. These occur in a gangue made up largely of pale green pyroxene—"green-felsite,"—and reddish brown garnet—"bull-felsite."—with calcite. The ore is either finely disseminated through the pyroxene, or occurs in large rather pure masses between the pyroxene and the limestone. Very little is found in the garnet. A considerable proportion of the pyroxene gangue is partially altered, and disintegrates rapidly on exposure to the air. There are also large areas of the pyroxene which are practically barren. A microscopic examination of a few prepared sections of the gangue shows that the pyroxene (variety omphacite) occurs in mosaics of clear individuals with turbid borders. The garnet, which shows zonary structure, and optical anomalies, is traversed by numerous cracks which are filled with turbid material, in part calcite. Towards the calcite, the garnet has a tendency to develop crystal outline. Bornite and chalcopyrite occur in small grains, solitary, or connected in groups by narrow stringers between the pyroxene individuals, inter-grown with them, or along cracks in them and the garnet. Calcite with the larger grains of the sulphides, well formed garnets-andradite—and vesuvianite, were the last to crystallize out, and filled all the interstitial spaces.

Subsequent to the formation of the ore body, it was cut by one of the later dykes of basic porphyrite. Between the seventh and eighth levels it varied in width from 4 to 6 feet, with ore on both sides. This dyke dipped to the south, and in its downward extension became much reduced in size. On the 760 level it is only 7 inches wide, and crosses the drift some distance south of the ore body. It is highly altered with a development of numerous fissures now filled with epidote, and pyrite. This intrusion caused considerable movement in parts of the ore body, and many small fissures were formed and subsequently filled with chlorite, pyrite and calcite. Some beautiful examples of slickensided surfaces are seen, especially where molybdenite occurs. The pyroxene and garnet have both been fractured, and under microscopic examination the former showed strain shadows, incipient and complete granulation, with considerable alteration. Bornite has been re-deposited along these lines of fracture, between individual grains, and along cleavage planes. It occurs in solitary and connected grains and parallel bands. Calcite of the first generation shows strain shadows, and the last phase in the formation of the deposit was the filling up of the small interstitial spaces with calcite. The order of crystallization was pyroxene and garnet, simultaneously, along with the greater part of the bornite, then the remainder of the bornite in larger masses associated with well-formed garnets, vesuvianite and calcite.

ORIGIN.

This deposit is closely connected with the intrusion of the coast granite, and is clearly of pneumatolytic origin, being an example of the Kristania type.

It is well known that molten magmas give off enormous quantities of aqueous vapors which in this case would have a profound effect on the limestone through which they would pass along zones of brecciation or bedding planes. The limestone has here been replaced by silicates rich in lime, and by sulphide ores with the consequent liberation of carbonic acid gas. With the exception of the lime and a small amount of magnesia, all the other constituents are foreign to the limestone, and must have been brought up from below with the aqueous vapors.

An approximate analysis of the pyroxene gangue resulted as follows: SiO_2 55.25, Fe_2O_3 and Al_2O_3 6.50, CaO 25.00, MgO 14.50.

Garnet (andradite) averages about 31%, and vesuvianite about 35% of lime oxide.

The deposition of ore and gangue went on simultaneously with the cooling of the granite magma, and the ore body was formed before the intrusion of the aplite dykes. These dykes have not been found as yet in the

Marble Bay mine, but they have been noted in two instances in the neighboring deposits.

ORE VALUES.

The ore throughout is essentially high grade and carries good values in gold and silver. The ore, which is finely disseminated through the pyroxene gangue, carries much higher values in gold and silver than the purer and more massive bornite and chalcopyrite. It has also been found that the percentage of copper has steadily increased with depth.

As it is necessary to mine considerable barren gangue which is intimately mixed with the productive, the ore is hand sorted before shipping and graded into coarse and fines. The waste, on account of its fluxing properties, is shipped in large part and sold to the smelter. At present the total production is sent to the Tacoma smelter for treatment.

In order to ascertain the average value of the ore, the smelter returns for the year beginning in June, 1905, and ending June, 1906, were examined with the following result:

Grade.	Gold oz. per ton.	Silver oz. per ton.	Copper per ct. (dry)	Net value per ton.
Coarse	0.498	4.138	6.765	$28.77
Fines	0.1678	1.569	1.602	6 88
Waste	Tr.–.08	0 15–0.9	0.22–0.8	0.50
Coarse	1.006	5.73	11.25	

The last entry of coarse grade refers to a shipment of 116 tons made in July, 1906.

About 13,000 tons are mined annually, and approximately for every ton of coarse, two tons of fines and two of waste are shipped. Through the courtesy of Mr. F. C. Robinson, of the Sheffield Smelting Works, I am enabled to publish a few interesting assays which he made of the ore and gangue. The samples were taken from a stope on the 660 level, and the gold and silver values are stated in ounces per long ton.

Assays			Analyses	I	II
Number.	Gold.	Silver.			
I.	0.40	18.60	Insoluble ..	31.60	43.10
II.	1.05	7.85	Copper	43.00	13.60
III.	0.008	0.86	Iron	10.30	9.90
IV.	0.025	0.07	Lime	Trace	....

I. Bornite and chalcopyrite (massive ore).

II. Pyroxene and garnet gangue with finely disseminated bornite.

III. Calcite after removing mineralized portions.

IV. Calcite and garnet after removing mineralized portions.

Numbers III. and IV. are interesting in showing the occurrence of gold and silver in what was apparently barren gangue. Free gold in distinguishable leaves and grains has been found occasionally, but it is not a common occurrence.

SIMILAR DEPOSITS.

The ore chutes of the Copper Queen and Cornell mines adjacent to the Marble Bay are associated with basic dykes, some of which are older than the ore bodies. These are very much decomposed and in places have altered to a serpentine which carries ore, and is occasionally traversed by small veins of greenish white asbestos. The former mine has been noted for certain occurrences of free gold and argentiferous tetrahedrite. The deposits in the White Horse District, Yukon Territory, differ from the above, in that they carry low values in gold and silver, and higher values in copper. Their mode of occurrence, however, seems to be identical.

CONCLUSION.

The past development of these mines on Texada Island has proved the ore bodies to a considerable depth, the Copper Queen being 740 feet deep, while a winze is now being sunk to the 860 level in the Marble Bay. As regards the permanence of these deposits, there seems to be very little doubt but that they will continue until the limestone granite contact is reached.

Magnetic Concentration of Iron Ores by the Grondal Process

By P. McN. Bennie, FitzGerald & Bennie Laboratories,
Niagara Falls.

(Toronto Meeting, 1907).

The writer had the pleasure of attending the Toronto meeting of the Canadian Mining Institute, in March, 1904, when a very interesting paper on Magnetic Separation was presented by Mr. F. T. Snyder. The technics of the magnetic separation of various materials were well covered in Mr. Snyder's paper, so that those features need hardly be again referred to.

In the present paper it is proposed to give an account of progress in magnetic separation with a specific process, and to draw some conclusions as to its possible bearing on the utilization of certain Canadian iron ores or to the economic benefit of the Dominion.

It is not the intention to enter closely into mechanical details of the various forms of apparatus used in the Gröndal Processes for grinding, separating and briquetting iron ores. The results obtained in actual practice are probably of superior interest, and for this purpose a typical series of products may be taken, as follows:

1. Ore from Herräng, Sweden, ground in the Gröndal Ball Mill, as prepared for subsequent magnetic separation by the Gröndal Process.

2. Tailing from this Herräng ore, after passing through the Gröndal Magnetic Separator.

3. Concentrate from Herräng ore, showing the perfection of the separation.

4. Briquette made from such concentrates by the Gröndal Briquetting Process.

The composition of these various materials, with reference to iron, sulphur and phosphorus content, is as follows:

TABLE I.

Results of Treatment of Herräng Ore.

	Crude Ore	Concentrates	Slimes	Briquettes
	per cent.	per cent.	per cent.	per cent.
Iron	40.00	65.20	9.6	63.01
Sulphur ...	1.20	0.17	...	0.003
Phosphorus.	0.003	0.0025	...	0.0025

Porosity: Per cent. of volume of briquettes = 23.9.

DEVELOPMENT OF THE GRONDAL PROCESS.

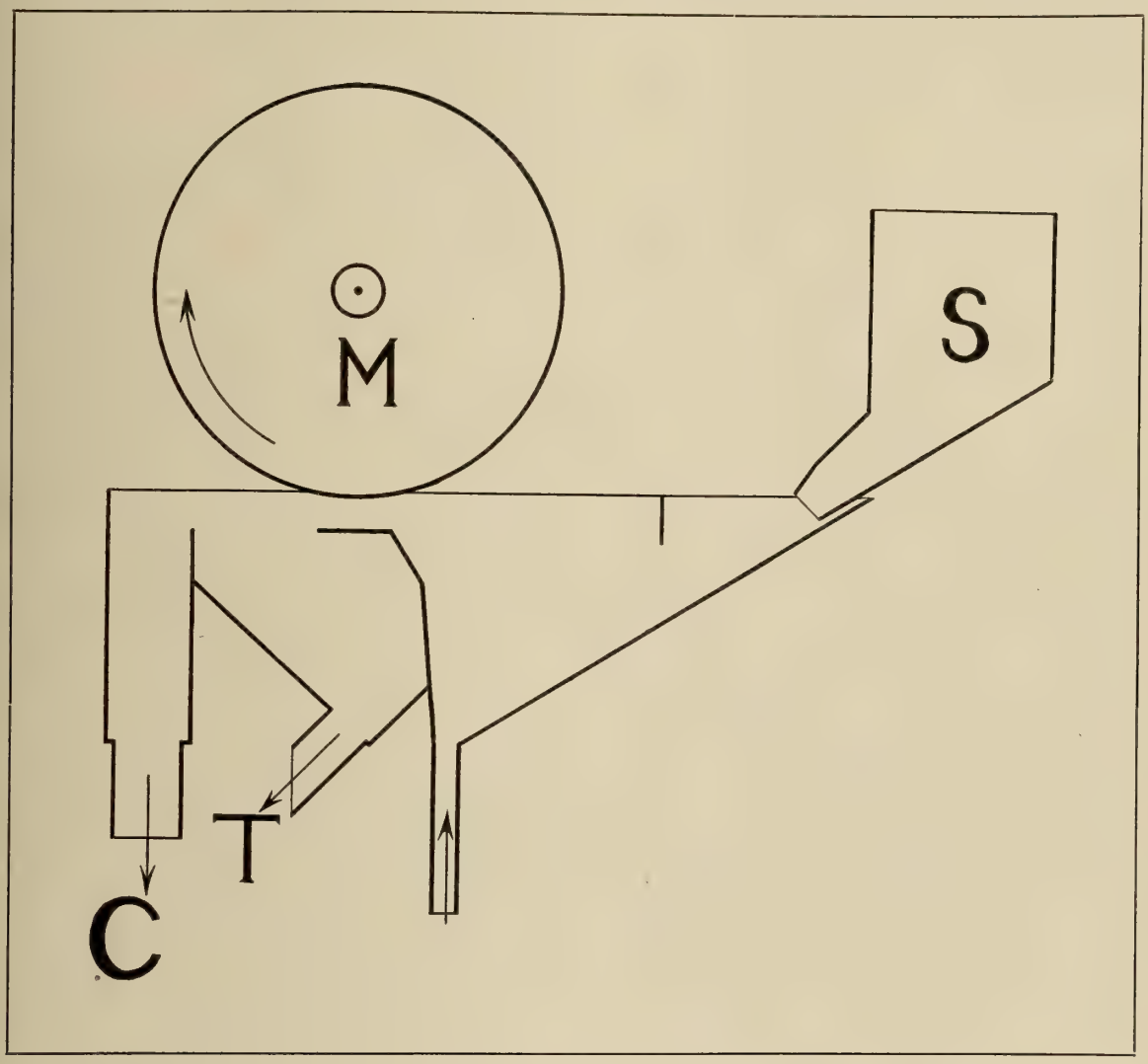
About 20 years ago the question of iron ore supplies became serious, and at that time magnetic separation received considerable attention from Conkling, Ball and Norton, and others, with the idea of utilizing large bodies of magnetc iron ore which could only be made available by means of magnetic concentration.

Then came the rapid development of the immense bodies of Lake ore, of a quality which could advantageously be used in the blast furnace, and except in certain restricted districts, interest in magnetic ores was lost. About the same time there was some hope that the magnetic iron ore deposits in Ontario would receive serious development, and indeed a number of fairly large shipments were made to the United States. But the development of the Lake ore bodies practically closed that market, and work on the Ontario mines declined to insignificance. In fact the discovery of those same Lake Superior ore bodies has had an influence upon the metallurgical life of both Canada and the United States but little appreciated nowadays.

In European countries, however, especially in Sweden, conditions were different. The supply of suitable ores ready for blast furnace use in their natural condition was limited and low grade; in many cases highly phosphatic and sulphurous ores had to be used; consequently great efforts have been made to perfect concentrating methods. The attention of many prominent engineers and metallurgists has been turned, with more or less success, towards the solution of the difficult problems involved in turning to account these ore supplies.

Mr. Gustaf Gröndal's efforts in this direction, extending over a number of years, have been more successful, the appliances and machinery invented by him for crushing, concentrating and briquetting low grade and impure ores being now so perfected as to constitute a complete commercial process. By these methods a great many hitherto practically valueless iron ores can be turned to excellent account by reason of the richness and purity of the concentrates and briquettes produced, and the comparatively low cost of production.

Primarily the Gröndal processes permit of the economic use of the many, in some cases immense, deposits of iron ore which are found in various places throughout the world, and which are unsuitable in their native state, owing to some objectionable characteristic, for economic



blast furnace practice, and the production of good quality pig iron. Usually, the objection to their use will be found to be one of the following:

1. That the ore is too low in iron content.
2. That it contains impurities which cannot be eliminated in the blast furnace.
3. That it occurs in a mechanical condition unsuitable for blast furnace use, except to a limited extent, such as iron sands and small ores generally.

Among the ores which may be commercially utilized by the Gröndal Processes may be instanced:

1. Magnetites of all kinds, including magnetic iron sands, containing as low as 25 per cent. iron.
2. Magnetites containing a high percentage of phosphorus and copper not chemically combined with the iron.
3. Purple ore and pyrites residues.
4. Nearly all kinds of iron ores containing a high percentage of sulphur.
5. Flue dust.

The Grondal Concentrating Process.

The scheme of treatment is briefly as follows:

1. The ore is crushed dry to about ½ inch cube or thereabouts.
2. Wet treatment in a Gröndal Ball Mill, which reduces the ore from the crushed size to 10 to 100 mesh, as may be found necessary.
3. The ground pulp is passed through a Gröndal Magnetic Separator, where the non-magnetic particles are removed.
4. The concentrates are pressed into briquettes and heated in the Gröndal Briquetting Kiln, from which they issue as hard, porous, easily reducible, ferric oxide briquettes, with a minimum percentage of sulphur.

To take each operation in detail:

Any good type of commercial crusher may be used in the preliminary crushing of the ore. Usually either a Gates or Blake crusher is employed.

The broken ore is conveyed and distributed to the feed hopper on the Gröndal Ball Mills. The feeding arrangement consists of an ordinary roller feeder driven at a uniform speed and so constructed as to admit of accurate adjustment of feed. The ball mill consists of a hollow cylinder, 4 feet in diameter, and varying in width from 4 to 8 feet. It is reinforced with steel ribs and lined with manganese steel, or other steel alloy of good wearing quality. The mill is charged with about two tons of chilled cast iron balls, of about 6 inches diameter.

The ends are of cast iron with suitable openings provided with a screen at the discharge end. The degree of fineness of the ore is regulated by varying the amount of water introduced into the mill.

It is found that working with ores of average hardness the consumption of iron, represented mainly by the wear on the balls, amounts to about 2 pounds per ton of ore treated.

The mills require from 20 to 25 horsepower each, make from 25 to 30 revolutions per minute, and grind from 50 to 100 tons of ore per 24 hours, from ½ inch down to from 10 to 100 mesh in fineness.

In order to free the pulp from the bulk of the non-magnetic slimes, it is often advisable to pass the pulp coming from the ball mill through a slime box before charging it into the separator proper. The slime box consists of a V-shaped box, the pulp entering at the top and a stream of water at the bottom. The slime boxes are usually built in pairs, and between each pair is placed an electro-magnet with a hatchet-shaped pole piece. This electro-magnet is of such strength as just not to lift any magnetic particles out of the water. The velocities of the pulp and clear water are so arranged that the heavier particles settle at the bottom, from whence they are drawn off to the separator. The function of the magnet is to arrest magnetic particles in the fine slimes which collect on the surface of the water immediately under the pole piece, and from time to time drop to the bottom whence they are carried off with the main pump to the separators.

The accompanying diagram shows the principle of the separator proper. The pulp feed from slimes now passes to this part of the apparatus. This consists of a series of magnets with flat pole pieces arranged with their N and S poles alternately. The magnets are enclosed in a plain brass drum. This drum is made to rotate at a speed of from 80 to 100 revolutions per minute, and about one inch above the surface of the pulp, which traverses a pyramidal box divided into two compartments by a partition reaching nearly to the top of the box. The pulp enters at the top of the box, and a stream of water, entering at the bottom and rising up on the same side of the partition, carries all the pulp well over the edge of the latter and thus immediately under the drum. The magnets within the drum powerfully attract and bring the magnetic particles out of the stream of pulp and against the revolving brass drum. The remainder of the pulp drops down on the other side of the partition, and is carried off by the water through the waste outlet. The magnetic particles are lifted by the drum to the very edge of the magnetic field, where they are thrown off centrifugally. The capacity of the double-drum separator (which is the form commonly used) is from 70 to 100 tons of ore per 24 hours; it requires about 6 amperes at 120 volts, or say one horsepower, while less than ¼ horsepower will drive the drums.

A plant consisting of four ball mills, four double-drum separators, and having a capacity of fully 200 tons of concentrates per 24 hours, would require approximately 180 gallons of water per minute, and a power plant generating 150 e.h.p. would be ample for all the motive power required.

The concentration process reduces the percentage of phosphorus more or less, depending upon the mineral form in which it occurs in the ore. In most magnetites it is found in the form of apatite, in which case the phosphorus can be almost entirely eliminated. For example at Gellivare, Sweden, the phosphorus is reduced from 1.29 in the crude ore to 0.005 in the concentrates, and 0.006 in the briquettes. The percentage of iron is raised to a high figure, and at the same time the amount of slag-forming minerals is lowered. As a result the ore is more easily reduced in the furnace, and requires less fuel per ton of iron. The quality of the pig iron will be materially improved when using purer ore and less fuel than ordinarily.

Sometimes the ore mined is a mixture of magnetite and hematite. The dry magnetic concentrating methods hitherto employed give rather unsatisfactory results as regards the iron content of the tailing. With the Gröndal concentrating process, where the ore is already slimed up in water, a retreatment of the tailings on jigs or slime tables can be carried out with advantage, thus increasing the output of the plant without crushing or grinding any additional tonnage of ore.

The Gröndal concentrating process can be regarded as practically the only existing method for the economic treatment of low grade ores in which the magnetite is so finely and intimately mixed with the gangue that the

ore has to be crushed down to less than say 20 mesh before it can be separated. Take the case of the banded jasper ore in the Temagami district, which would require very fine grinding to effect an economic recovery of iron; the Gröndall Process could do this where no other could. But it is also obvious that such fine ores must be briquetted.

The Grondal Briquetting Process.

Concentrates produced by this process, iron sands, pyrites, residues, small ores generally, as well as ores containing a high percentage of sulphur, which are unsuited for use in the blast furnace, are next briquetted.

The material is conveyed to the briquetting process. These are drop presses—the height of the drop being from 6½ to 7½ inches, and the briquettes receive three blows, the falling weight being about 1,800 pounds. The briquettes may be of various sizes, but are usually made 6 in. x 6 in. x 3 in., weighing from 8 to 10 pounds each. Each press requires 3 e.h.p., and will make from 500 to 750 briquettes per hour. The pulverized ore is pressed into briquettes without any binding material whatever, the moisture in the ore being so adjusted as to obtain briquettes sufficiently firm to be removed from this press to the cars used in the furnace.

The briquettes are taken from the press and placed on the furnace cars. These are made of iron and covered with fire brick. Along each side of the car is a deep flange which dips into a channel filled with sand placed along the sides of the furnace, thus forming a gas-tight seal. The ends of adjacent cars are fitted with a groove and projecting rib respectively. By this means the surface of the cars forms a gas-tight partition and thus prevents the lower portion of the cars, frame, wheels, etc., from becoming heated. The cars measure 3 ft. 6 in., and hold from 15 to 16 hundredweight of briquettes arranged on edge in two tiers.

The Furnace.

The furnace is fired by gas derived preferably from gas producers, although blast furnace gas can be used. The combustion chamber is situated about one-third of the length from the intake end. The air needed for combustion is introduced below and traverses the row of cars, thus helping to keep the wheels and framework cool, and at the end of the furnace is diverted to the top of the row of cars, traversing the burnt briquettes, cooling them, and becoming itself heated before reaching the combustion chamber. The products of combustion pass over the entering cars, assist in drying and heating the briquettes, and finally escape through a stack at a temperature of only 150 deg. Centigrade. The furnace being thus constructed on the regenerative principle, has a very good thermal efficiency, radiation is small, and the chief loss of heat is due to the evaporation of the water contained in the briquettes (5 to 7 per cent.) A car of finished briquettes is drawn about every half hour, depending somewhat on the degree of desulphurization required. Recently, furnaces have been arranged so as to give a continuous movement to the cars, increasing the capacity of the furnace considerably.

The temperature in the combustion chamber of the briquetting furnace reaches 1,300 deg. to 1,400 deg. C. At this heat the particles agglutinate sufficiently to form a firm, hard briquette, able to stand rough handling and long transport. The briquettes, though hard, are very porous, and are consequently far more easily reduced in the blast furnace than ordinary lump ore. The briquette made from Herräng ore, previously mentioned, has a porosity of 23.9 per cent. of its volume.

When briquetting iron ore concentrates and using producer gas for fuel, the consumption of coal has been found to average 7 per cent. of the weight of briquettes burnt.

Grondal Briquettes.

The Gröndal Briquette is unique in that it does not contain an added binder, and, therefore, there is no foreign material such as lime, to be heated and slagged off. In the case of magnetic oxide concentrates the particles are completely peroxidized, owing to the very free supply of air given to the furnace during the process of burning the briquettes. Such peroxidized ore is very easily reduced in the furnace, thus introducing a certain fuel economy.

Treatment of Pyrites Residues.

Briquettes made by this process from pyrites residues and purple ore have proved to be entirely satisfactory in the open hearth steel furnace. At Cwmavon, ores containing 2 to 4 per cent. sulphur, and sometimes more, are being successfully treated by this process.

Capacity of Furnace.

The output of one furnace varies from 30 to 80 tons in 24 hours, according to the class of ore used, and the degree of desulphurization required; for in addition to its mechanical action this furnace acts as an exceptionally efficient calciner for removing practically all of the sulphur.

The following analyses of crude ore, concentrates and briquettes will give an idea of the results obtained by the use of the Gröndall Processes:

TABLE II.

Results of Gröndal Treatment.

	Iron.	Sulphur.	Phosphorus.
Herrang, Sweden.			
Shown in Table I.			
Gellivare, Sweden.			
Crude ore	58.96	0.036	1.29
Concentrates	72.38	0.003	0.005
Briquettes	69.49	0.002	0.006
Salengen, Norway.			
Crude ore	36.43	0.021	0.31o
Concentrates	71.76	0.015	0.008
Briquettes	.....	.....	.....
Pitkaranta, Finland.			
Crude ore	28.40	2.60	0.260
Concentrates	69.59	0.132	0.007
Briquettes	67.98	0.011	0.008
Cornwall, Penna.			
Crude ore	30.65	1.603	0.012
Concentrates	69.95	0.036	0.003
Briquettes	69.90	0.010	0.005

The results from Cornwall ore were obtained with a ten ton sample sent to Herräng about a year ago, as there is not yet a plant available on this side of the Atlantic.

Separation of Titanium.

At the FitzGerald & Bennie Laboratories, Niagara Falls, Ontario, a small separator of the Gröndal type was installed in June of last year, and some tests were made on the separation of titanium from ore, working with what are known as Moise Beach sands, from the St. Lawrence River. The following results were obtained:

Original ore	16.57 pct. TiO_2
Concentrate	4.21 "
Middling	19.48 "

It should be remarked that the concentrates were obtained by a single passage through the separator. Doubtless even better results could be obtained from finer grinding, and repassing through the separator.

Cost of Plant.

It is impossible to give anything but bare approximations as to cost of plant, which varies considerably with the local situation and conditions. The figures quoted are based upon cost of materials, and cost of erection, in the United States:

Concentrating plant for 400-500 tons of crude ore per day	$45,000
Briquetting plant for 200 tons of concentrates in 24 hours	65,000
	$110,000

For 100 tons of concentrate per day these figures would be about $27,000 and $39,000 respectively, a total of $66,000.

Cost of Concentrating.

The cost of concentrating will naturally vary with the character of the ore treated and the amount of iron contained in same. Assuming the treatment of an average magnetic iron ore, containing 40 per cent. iron, and the production of a concentrate carrying about 63 per cent. iron, the cost of concentrating varies from 30 to 45 cents per ton of concentrates. These figures refer to the mechanical treatment only, and exclude the cost of ore.

Cost of Briquetting.

The cost of briquetting is also an item varying with local conditions. A briquetting plant of 200 tons daily capacity would consist of four to seven furnaces, depending upon the ore, and to a large extent on the amount of sulphur to be removed. The cost per ton for briquetting can be taken, under normal conditions, as varying between 45 and 85 cents per ton.

At a small plant consisting of one furnace, producing 25 to 30 tons per day, the actual cost, including labor, coal, rent and taxes, but exclusive of depreciation and royalty, amounts to 85 cents. This plant is working on pyrites residues, and owing to its small size and nature of the work, the cost is high.

On the other hand, at a typical plant in Sweden, turning out 120 tons of briquettes daily, the cost of briquetting amounts to 77 cents per ton. At one of the Swedish plants of recent construction the cost has been reduced to 67 cents per ton.

Recently the briquetting furnace has been simplified and improved so as to materially decrease the cost of installation, and at the same time to lower the cost of briquetting.

Treatment fo Canadian Ores.

The present situation in Canada, and particularly in the Province of Ontario, is similar to that in the Scandinavian countries, in many ways. Not over blessed with ready fuel, and with iron ores that in many instances require concentration, yet it is well known that certain qualities of iron (Swedish pig, for example) are produced, which bring a premium on the market. There is no reason why Canada should not largely augment its production of high-grade pig iron, and have as great a demand for it as for the Swedish article.

There are many bodies of magnetic iron ore in Ontario, running from 35 to 50 per cent. iron, that would be so improved by proper treatment as to produce premium ores, for which there is now and probably will continue to be a brisk demand.

For ores that demand fine grinding to recover an economical percentage of iron content, the Gröndad briquette affords a means of converting unsalable ores into an article that will actually bring a premium, thus helping to pay for the cost of treatment. Only recently a blast furnace manager told me he would be glad to get 200 tons a day of such briquettes. Gröndal briquettes are now being shipped in considerable quantities from Sweden to Great Britain, where they command an instant market at prices above the average.

Electric-Thermic Processes.

Another feature certain to be of considerable economic value to Canada is the application of electro-thermic processes for producing high-grade pig iron and steel. Broadly speaking, the use of sufficient electrical energy to produce one ton of pig iron in the electric furnace means the displacement of about 1,600 pounds of fuel. Coal once used is gone forever, while water powers maintain themselves by a natural process, a fact of great economic importance to Canada. The fortunate existence practically side by side, of iron mines and extensive water powers, produce conditions very favorable to the electro-thermic process. The writer believes the Government would do well to foster the development of that branch of metallurgy as much as possible, to enable the country to realize on its natural and unique resources.

Many of the ores could doubtless be used direct, others would require concentration, and still others would have to be briquetted, but the economy of producing finished material wherever possible "on the spot" is obvious. Science and Art have now placed in the hands of those who will, means of utilizing these resources, and thus adding to the nation's wealth.

The monazite produced in the United States in 1906 all came from North and South Carolina. The output of crude sand amounted to approximately 2,000,000 pounds, averaging about 30 per cent. monazite. The grade of this sand was so variable and the prices realized on different lots were so irregular that cleaned sand has been used as an estimate of the quantity of monazite produced, an additional reason for so doing being furnished by the fact that the greater part of the crude material is cleaned by local mills before shipment, and the grade brought up to 80 per cent. or more of monazite. On a basis of 80 per cent. production, North Carolina produced 697,275 pounds of the mineral, valued at $125,510; and South Carolina 148,900 pounds, valued at $26,802; the total for the United States amounted to 846,175 pounds, valued at $152,312.

The production for 1905 amounted to 1,352,418 pounds, valued at $163,408. This amount represented in part crude and in part cleaned sand—a fact that explains the increase in quantity without correspoding increase in value.

The condition of the monazite market in the United States in 1906 was fairly strong, despite the fact that the price of thorium nitrate, which is manufactured principally from monazite, was reduced nearly one-half early in the year by the German thorium combine. Though made with the intention of killing all competition, this cut has resulted only in the temporary closing down or the bankruptcy of a few of the smaller companies.

THE RICHARDSON MINE

Upper Seal Harbor Gold District, Nova Scotia.

BY PERCY BROWN, M.E.

The Richardson Gold Mine is situated about two miles from the Village of Goldboro, Guysborough County, which is located on the east side of Isaacs Harbor, an important harbor on the Atlantic coast of Nova Scotia, some 80 miles east of Halifax.

The mine was discovered in 1892 by a prospector named Howard Richardson, who found rich quartz in the bed of a brook known as Gold Brook. This has given the name Goldbrook to the settlement which has sprung up in the vicinity of the mine.

Local capitalists became interested and a fifteen-stamp mill was erected in February, 1893. In July, 1894, this was enlarged to a twenty-stamp mill. In 1896 twenty stamps more were added and the plant modernized to a certain degree. The returns for these first four years are as follows:—

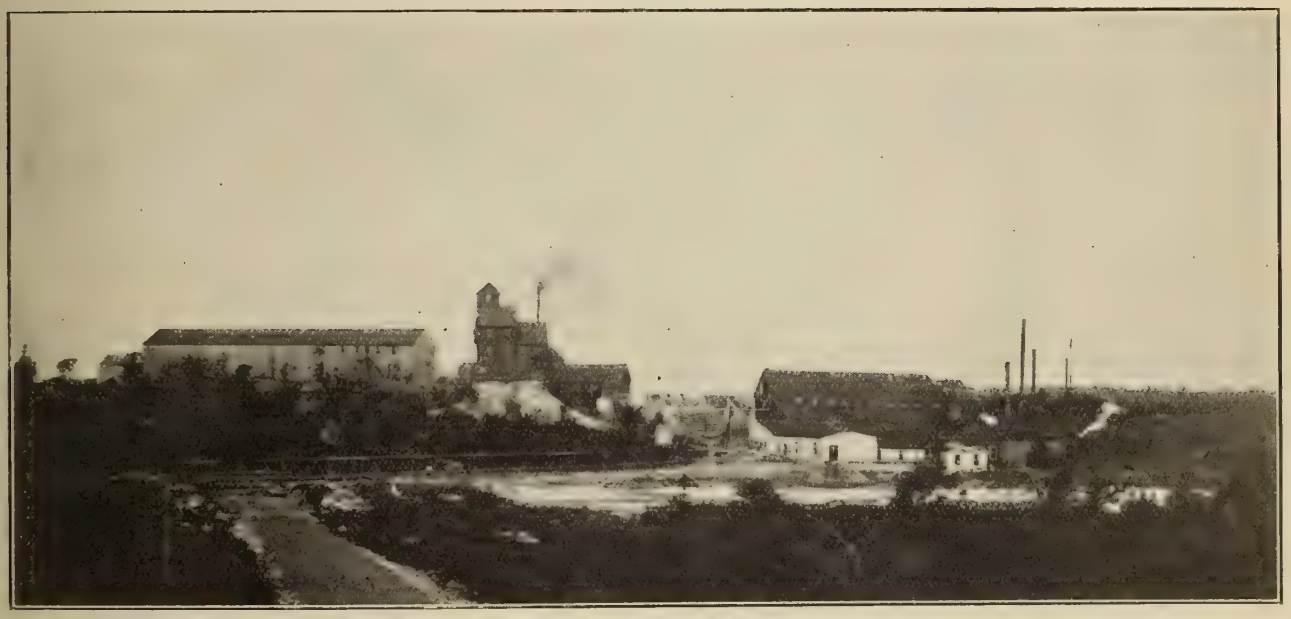
Year.	Tons. Crushed.	Yield. Ozs. Gold.
1893	5,408	2,054
1894	6,997	1,674
1895	10,293	1,677
1896	16,626	2,186
1897	25,150	3,004
1898	24,124	2,478

from 193.363 tons of quartz crushed, or a total value of nearly $600,000. It must be remembered that this value represents only the amount of free gold in the ore, and that large amounts went to waste can be seen by noting the amount of gold now being secured from the concentrates.

It is true that a large cyanide plant was erected to treat the tailings from the mill without concentration, but, while the percentage of recovery in the plant was satisfactory, yet the value of the mill tailings was too low to admit of economical treatment in this way.

In 1903 the Richardson Mine was taken over by the present owners, The Boston Richardson Mining Company, who spent the first year of their ownership in carrying out a new system of development, namely, sinking a 400-foot vertical shaft, rebuilding the 60-stamp mill and putting the plant in its present shape.

The accompanying plan shows a portion of the plant and property of the Boston Richardson Mining Company. It does not show, however, the location of the other belts, similar to the Richardson, which are being opened about 1,000 feet east of the vertical shaft at what is known as East Goldbrook, or the very rich and promising, though probably smaller belts, cut near the



BOSTON RICHARDSON MINING COMPANY'S PLANT.—Looking West .

The ore body or belt consists of a mixture of bands of slate and quartz. Under the early management an attempt was made to sort the ore, throwing out the slate as worthless and milling the quartz. The result of this policy was that the mine was nearly closed down and the manager resigned. The new manager, not only milled the whole belt, but actually crushed the waste dump from former operations with most satisfactory results.

As a direct consequence of this policy the mill was enlarged to one of sixty stamps early in 1901.

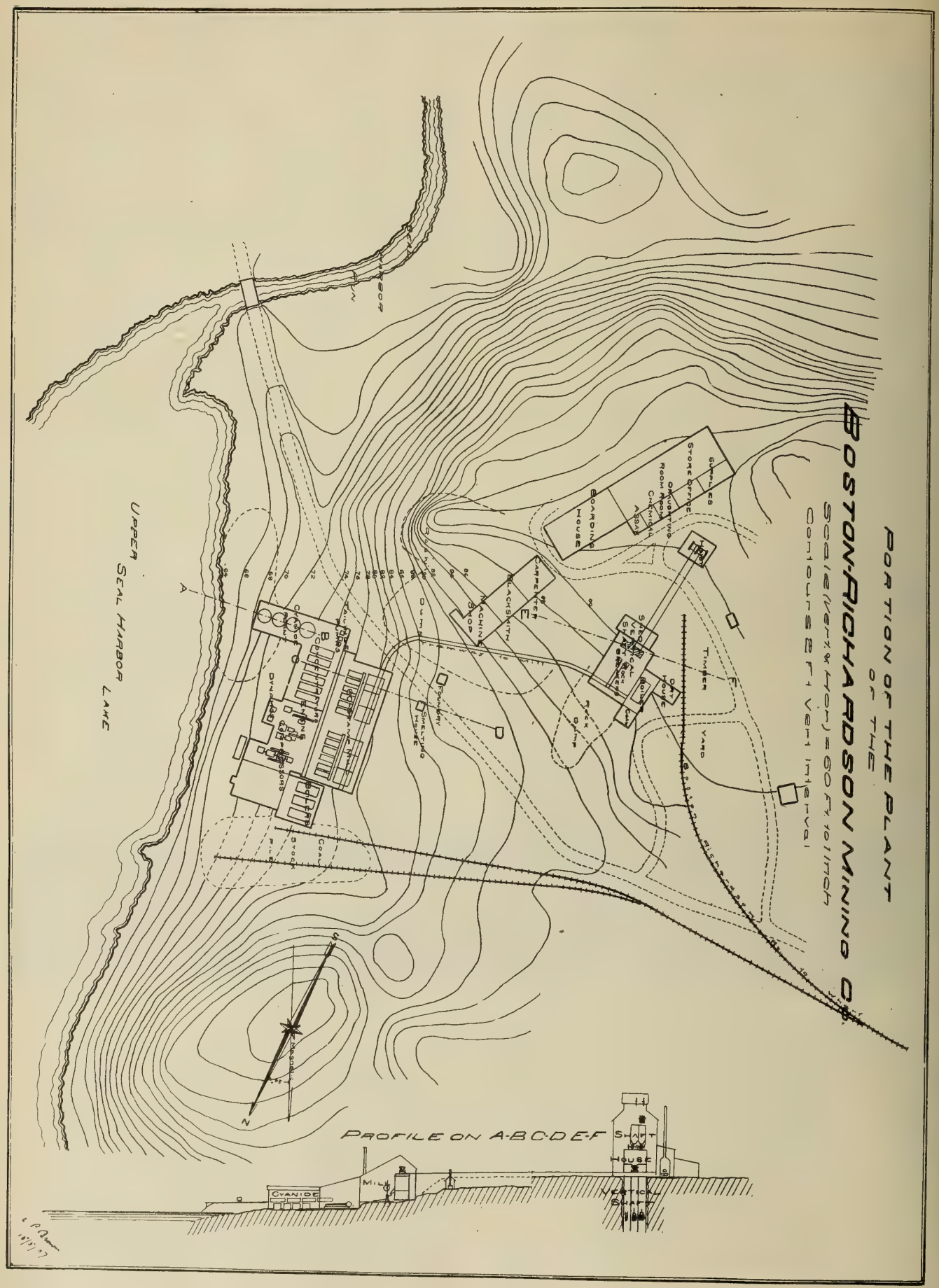
The total production of the mine from February, 1893, to December, 1902, as shown by the sworn returns at the Mines Office at Halifax, was 28.054 ozs. of gold

west end of the property, some 3,000 feet west of the vertical shaft, and known as West Goldbrook.

The geological conditions of the district are peculiar and will be the subject of a later paper. For the present it is sufficient to say that the outcrop or horizontal sections of the vein or belt has the shape of a horse-shoe.

The three main working shafts used in the original system of mining were sunk in this ore body and dipped to the north, east and south, respectively, coming to a common deck-head at the surface.

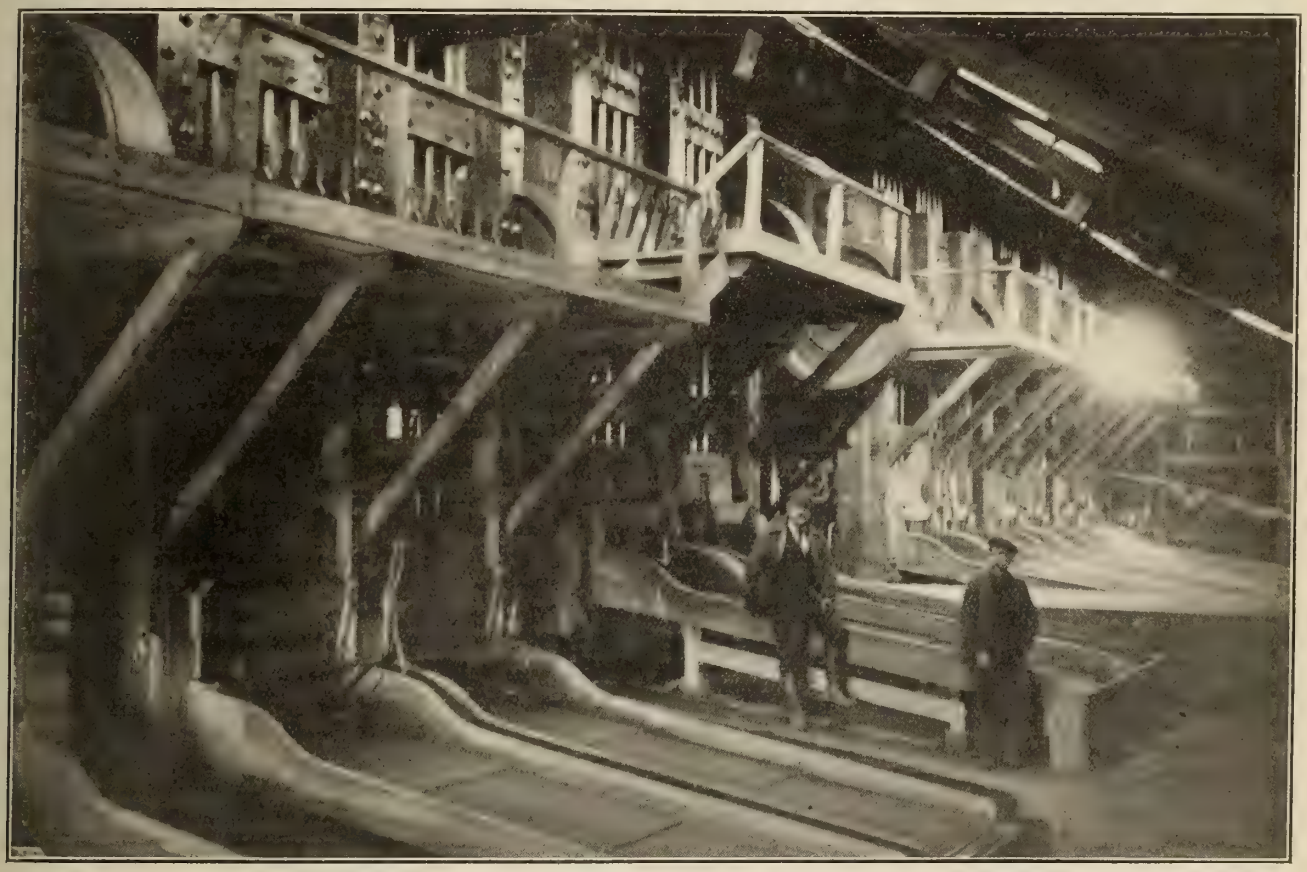
The old workings are situated about 800 feet west of the present vertical shaft, which cuts the apex of the belt, as it pitches eastward, at a depth of about 400


PORTION OF THE PLANT
OF THE
BOSTON-RICHARDSON MINING Co.
Scale (Vert & Hori) = 60 Ft to 1 Inch
Contours 2 Ft Vert Interval
UPPER SEAL HARBOR LAKE
PROFILE ON A-B-C-D-E-F
CYANIDE
MILL
SHAFT HOUSE
VERTICAL SHAFT
N

feet. From the bottom of this shaft levels have been driven westward on the north and south legs, the former being about 1,000 feet and the latter about 1,200 feet in length.

Raises have been driven upward towards the old works from these levels and the ore mined by a modern system of overhand or back stoping. In this connection it may be noted that the early management of the mine claimed they could not use the method of overhand stoping as the back would not stay up. The present management, although they have mined portions of the same ground, have not experienced this difficulty. The underground foreman says he finds the chief difficulty is that the back is too ready to stay up.

The ore is run into chutes, from which it is trammed to large bins at the bottom of the vertical shaft. It is hoisted from here to the surface in a self-dumping skip of two tons' capacity.



INTERIOR OF 60-STAMP MILL—BOSTON-RICHARDSON GOLD MINE.

The ore is dumped from the skip on to an inclined steel plate and grizzly, over which it is fed by hand to one of the two 9″ x 15″ Blake rock crushers. The crushed ore drops into a bin and is trammed to the mill in a side dumping car holding about 1½ tons. This work is so arranged that one man at the rock breaker and one man running the car can handle all the ore crushed by the 60 stamps in 24 hours during one shift of 10 hours. Four of the 10-stamp batteries in the mill are set on concrete foundations and two 10-stamp batteries on end wood. The results of the work here show conclusively that when concrete foundations are properly set and where rubber is used between anvil and mortar, that the concrete is more durable than wood.

The mill is equipped with suspended Challenge feeders. The stamps, newly shod, weigh 950 pounds each. They drop 7 to 7½ inches 95 to 98 times per minute. The height of discharge (top of die to bottom of screen) is about 6 inches. The screen now used is 18 by 24 mesh, No. 26 wire, twilled. Considerable experimental work has been done with regard to screens. Formerly one of plain wire, 30 mesh, No. 28 wire, was used; but this was discarded in favor of the one in use at present, as the first cost of this screen is about half as much as the other, it lasts almost twice as long, the efficiency of the stamps is greatly increased thereby and there is very little difference in the saving of gold.

The water is introduced at the back of the mortars and is so arranged that it strikes about half way up the die. No inside plates are used. The chuck blocks were originally provided with them, but their use has been discontinued. Silver-plated copper apron plates 12 feet in length are used and are found to keep in excellent condition as the amalgamators do not attempt to take off the amalgam too close. Under ordinary conditions the amalgam is removed twice a week. Mercury is fed to the batteries, the amount being judged by the "feel" of the plates. Five men are employed, 3 on day shift, 2 at night. The mill is cleaned up once a month in the usual way. Ten stamps only are cleaned up at one time, the rest of the mill running as usual.

From the apron plates the pulp passes to 6 Wilfley concentrators. The concentrates, which consist almost wholly of Arsenopyrite, are carried by a shaking sluice to a settling tank. From this they are shovelled to a ing box and thence to the treatment tank.

The method used is known as the Bromo-Cyanide process, and is a modification of that employed so successfully at Deloro, Ontario. The cyanide plant is very simple, and consists of:—

4 treatment vats 12 feet in diameter, 18 inches deep.
4 sump tanks, 6 feet diameter, 6 feet deep.
2 storage tanks, 6 feet diameter, 6 feet deep.
2 zinc boxes.
1 acid clean-up tank.

Two men, one on each shift, look after the concentrators and run the cyanide plant. One man is employed, on day shift, to load and unload the tanks.

It is the intention of the company to install at an early date a plant for the recovery of the arsenic.

The following table gives a summary of results for the past year:

Month.	Tons of Ore Milled.	Value Recovered in Mill.	Tons of Concentrates Treated.	Value Recovered in Cyanide Plant.	Total Value Recovered.
May, 1906	3,258	$8,041.00	82.02	$ 807.50	$ 8,848.50
June, 1906....	3,345	8,601.75	76.48	778.75	9,380.50
July, 1906....	2,964	7,072.84	78.25	722.16	7,795.00
August, 1906..	3,939	9,310.17	82.72	646.83	9,957.00
Sept., 1906 ...	3,441	9,082.87	32.78	439.13	9,522.00
October, 1906.	4,014	10,735.22	98.58	1,344.28	12,079.50
Nov., 1906 ...	4,326	9,186.72	132.11	1,847.78	11,034.50
Dec., 1906 ...	3,873	5,743.41	93.80	1,901.09	7,644.50
January, 1907.	3,024	6,493.08	134.03	1,933.24	8,426.32
February, 1907	3,283	7,517.23	143.03	2,610.72	10,127.95
March, 1907 ..	3,717	8,514.09	150.57	2,289.90	10,803.99
April, 1907 ..	3,837	9,612.03	185.12	2,044.29	11,656.32
	43,021	$99,910.41	1,289.49	$17,365.67	$117,276.08

The average cost of mining—operation and maintainance—during this time was *$135 per ton,* and it must be borne in mind that this cost covers, not merely the ore milled, which includes only about one-half the ore broken in the mine, but also the remainder which is left in the mine as filling until such time as the stopes in that portion of the mine are worked out. Thus at the present time there are over 20,000 tons of broken ore in the mine ready to be hoisted.

The above cost includes also the cost of all development and prospecting, sinking an incline shaft 22 feet x 10 feet for a depth of 400 feet from the 400-foot level to the 550-foot level, driving the greater portion of a 500-foot cross-cut and driving the levels and raises necessary to mining.

The average cost of Milling—operation and maintainance—for the year was *0.33 per ton.* The average cost of cyaniding for the past six months was $2.37 per ton of concentrates, or $0.08 per ton of ore milled. The following cost of supplies and scale of wages is given in order that the reader may intelligently compare the above costs with those in other places:

Coal, average cost, $4.00 per ton.
Dynamite, average cost, $0.20 per pound.
Wages—Drillmen, $1.75 per day.
Helpers, $1.50 per day.
Trammers and muckers, $1.50 and $1.35 per day.
Millmen, $40.00 to $65.00 per month.
Cyanide men, $2.00 per day.
Hoistmen, $2.00 per day.
Engineers, firemen and machinists, $1.65 per day.
Blacksmiths, $1.75 to $2.50 per day.
Carpenters, $1.60 to $1.75 per day.
Laborers, $1.35 per day.

The high price of coal may not be, as some of our authorities declare, the reason of the decline of the gold mining industry in Nova Scotia; but it certainly tends to greatly increase the cost of mining and milling.

The Boston Richardson Mining Company intend to greatly enlarge their milling capacity at an early date; indeed, ten extra stamps and accessories are now on the ground.

The Company also intend to change their system of power to electricity or gas, which will materially reduce costs.

My thanks are due to Mr. H. S. Badger, superintendent of the Boston Richardson Mine, for his kind assistance in the preparation of this paper.

PIG LEAD ANALYSES

The following is a list of analyses made by the Osaka (Japanese) Technical Analyzing Department. The Trail brand is electrolytic lead, produced by the Consolidated Mining & Smelting Company of Canada, Limited:—

Selby—Per cent. lead, 99.9579; per cent. insolubles, 0.0040; per cent. bismuth, 0,0300; per cent. cadium, trace; per cent. nickel, 0.0001; per cent. cobalt, none; per cent. silver, 0,0010; per cent. manganese, 0.008; per cent. copper, none; per cent. antimony, none; per cent. tin, 0.0004; per cent. arsenic, 0.0024; per cent. zinc, 0.0003; per cent. iron, 0.0027.

Trail—Per cent. lead, 99.9890; per cent. insolubles, trace; per cent. bismuth, none; per cent. cadium, none; per cent. nickel, trace; per cent. cobalt, none; per cent. silver, 0.0025; per cent. manganese, none; per cent. copper, 0.0003; per cent. antimony, none· per cent. tin, 0.0007; per cent. arsenic, 0.0020; per cent. zinc, 0.0002; per cent. iron, 0.0053.

Smelter—Per cent. lead, 99.9762; per cent. insolubles, trace; per cent. bismuth, 0.0046; per cent. cadium, 0.0002; per cent. nickel, trace; per cent. cobalt, trace; per cent. silver, trace; per cent. manganese, 0.0003; per cent. copper, none; per cent. antimony, 0.0137; per cent. tin, none; per cent. arsenic, 0.0090; per cent. zinc, trace; per cent. iron, 0.0039.

English Chemical—Per cent. lead, 99.9693; per cent. insolubles, trace; per cent. bismuth, trace; per cent. cadium, 0.0007; per cent. nickel, 0.0003; per cent. cobalt, trace; per cent. silver, 0.0020; per cent. manganese, none; per cent. copper, 0.0097; per cent. antimony, 0.0149; per cent. tin, none; per cent. arsenic, 0.0002; per cent. zinc, trace; per cent. iron, 0.0029.

B. H. P.—Per cent. lead, 99.9853; per cent. insolubles, trace; per cent. bismuth, none; per cent. cadium, trace; per cent. nickel, none; per cent. cobalt, none; per cent. cobalt, trace; per cent. silver, 0.0009; per cent. manganese, none; per cent. copper, none; per cent. antimony, 0.0108; per cent. tin, 0.0004; per cent. arsenic, none; per cent. zinc, 0.0001; per cent. iron, 0.0025.

Enthoven—Per cent. lead, 99.9851; per cent. insolubles, trace; per cent. bismuth, 0.0048; per cent. cadium, trace; per cent. nickel, trace; per cent cobalt, trace; per cent. silver, 0.0015; per cent. manganese, none; per cent. copper, none; per cent. antimony, 0.0160; per cent. tin, none; per cent arsenic, none; per cent. zinc, trace; per cent. iron, 0.026.

Note.—Selby and Smelter are American; Trail, Canadian; Enthoven and Chemical, English; B. H. P., Australian.

NOTES ON THE MINERAL FUEL SUPPLY OF CANADA

R. W. Ells, D.D.

(Abstract of paper read before the Royal Society of Canada.)

In discussing the question of mineral fuels, a number of substances other than coal proper must be considered. The coals themselves include several varieties, such as anthracite, which is found along the eastern flank of the Rocky Mountains, and to some extent on one of the Queen Charlotte group of islands in the Northern Pacific Ocean; the true or bituminous coals with their resulting coke, and the lignitic coals and lignites which are not capable of being coked, and which vary from brown to black and in quality from a fuel nearly equal to many of the true coals to others not far removed from peat. In addition to these, the minerals anthraxolite, oil shale, albertite and petroleum and natural gas must all be regarded as forms of fuel. They are often found in large quantities and at many widely separated points; while the immense stores of peat are bound to become valuable in a few years.

At points where the distance from coal fields is great, peat must become locally valuable. This is true of Quebec, Ontario and Eastern Manitoba.

The geological horizons of the several coal deposits found in Canada extend from the Devonian upward into the Tertiary. Of the other fuels, some of them range downward to our lowest rocks, anthraxolite, which is a form of carbon, being found in those of Huronian and Cambrian age. The geological horizons of the workable coals are, however, rather more limited, although even here the early ideas that the economic deposits of coal belonged especially to the Carboniferous time have long been set aside, by the fact that many of the highest grade coals of the West belong to comparatively recent rocks and extend through the Cretaceous to the middle Tertiary. These Western coals present several varieties in the same field, the difference being due apparently to various degrees of alteration of the original deposit of carbonaceous matter.

Anthraxolite is more closely related to the rock oils or petroleum than to the true coals It is found in widely separated horizons. In its mode of occurrence it differs entirely from coal, in that it is always found in the form of veins which traverse strata of different ages instetad of occurring as bedded deposits. From its presence in the rocks of the Laurentian and Huronian systems, as well as in the Cambrian and Silurian formations, it would, on the hypothesis that all bituminous substances are of organic origin, indicate that life in some form existed in the remotest periods of the earth's history.

Anthraxolite is the oldest mineral fuel. In Labrador it has been found in veins some inches wide, traversing the Cambrian rocks; in Quebec, along the St. Lawrence, near Point Levis, and on the Island of Orleans, it occurs in pockety masses in slates and sand stones of upper Cambrian age. It is also found in Ontario in black Cambrian slates; in granite as veins of very pure quality; and in limestone in association with veins of barite. Anthraxolite has no economic importance as a fuel.

Closely allied to anthraxolite in composititon are petroleum and asphalt, as also to some extent the peculiar form albertite, which was at one time largely mined in New Brunswick, and which also was exceptionally free from ash. As a class these minerals are quite distinct from the several varieties of coal proper, in composition and in origin.

In some areas where oil wells occur the oil has come to the surface and become thickened, forming what are known as gum-beds. This material was found in large masses in the Petrolia oil fields prior to tthe discovery of the oil itself in quantity. But in the case of the albertite of the Albert mines in New Brunswick, this thickening of the natural oils must have recurred through some cause other than exposure, since this mineral filled a fissure in bituminous slates to a depth of 1,500 feet, with a length of over half a mile.

In the matter of hard coal or anthracite, the people of Eastern Canada are to a large extent dependent upon the immense deposits which occur in the eastern portion of the United States; but in all other varieties it will be found that Canada has an unlimited supply, much of which is readily accessible. Anthracite, also, of excellent quality and of great extent, is found along the eastern slopes of the Rocky Mountains.

The existence of coal fields in Southwestern Newfoundland has been known for many years. These may possibly represent the extension eastward of the Sydney coal basin. The actual extetnt and value of these coal basins have never been definitely ascertained.

In Nova Scotia the coals are for the most part confined to the Carboniferous formation and the largest workable seams belong to the middle portion, or what is usually styled the productive coal measures. This formation is found at Sydney, on the eastern coast of Cape Breton, and in Richmond and Inverness, on the west side of the island; at Pictou, in the eastern part of Nova Scotia proper; and at Springhill and the Joggins in the northwest of the Province.

Seams of considerable size are found in tthe underlying portion of the Carboniferous, otherwise known as the millstone-grit formation, and occasionally the mineral occurs in the upper Carboniferous or Permian, where coals of no great thickness have been recognized in that part of the Counties of Colchester and Pictou.

All the coals at present worked in the Province are of the bituminous variety. Associated with the Pictou coals are occasional seams of rich bituminous oil shale, known as stellarite, from which oil can be distilled.

In the southern half of Nova Scotia, which is occupied by great areas of granite, slates, quarttzite, etc., no trace of coal is found.

The Sydney coal field extends along the eastern shore from Mira Bay on the southeast to Cape Dauphin at the entrance of Bras D'Or Lake. Mr. Hugh Fletcher estimates the area of the basin as about 200 square miles. The aggregate thickness of coal in the several workable seams varies from 13 1-2 feet in the Dauphin area to 44 1-2 feet in Sydney Harbor, the seams ranging from 3 to 9 feet in thickness. The dip is generally at a low angle seaward.

On the west side of the island of Cape Breton, in Inverness and Richmond Counties, large and important coal basins are located, the seams being thick and of good quality.

On the mainland the thick seams of the Pictou basin have been producers of coal for more than eighty years. In this area are comprised some of the largest seams

in Eastern America, the main seam in the Sttellarton area having a thickness of forty feet, with several others in the vicinity of very large size.

In the Cumberland basin, as seen at Springhill mines, there are a number of seams, many over ten feet thick. These have been worked for more than thirty years. In tthe western part of this basin, along the shore of Cobequid Bay, is the old colliery known as the Joggins mine, showing thin seams, the thickest only five feet. These seams extend along the margin of the Springhill basin, and along the outcrops are a number of small collieries.

(To be continued.)

CRYSTALLIZATION OF ASBESTOS

By W. J. Woolsey, Cobalt, Ont.



During the past winter I obtained hand samples of serpentine from the various producing localities in the Eastern Townships, Quebec, and had rock sections made for examination under the miscroscope.

Work on the various sections exhibited the characteristics commonly noted in the serpentines. One section, however, exhibited the phenomenon of crystallization of the chrysotile in a marked degree, as shown by the accompanying micro-photograph.

It will be observed that the crystallization extends from a cleavage plane outward in either direction. The concentration of the impurities to this centre accounts for the accumulation of foreign material so frequently found in the centre of the asbestos veins.

TRIPOLI DEPOSITS IN CALIFORNIA

The diatomaceous deposits so widely distributed in the coast ranges of California are found in such purity and such inexhaustible quantities in Northern Santa Barbara County as to give them great commercial value, and it is for this reason that a description of the occurrences is included by the United States Geological Survey in the Contributions to Economic Geology for 1906 (Bulletin No. 315). The paper was prepared by Messrs. Ralph Arnold and Robert Anderson as the result of field work in 1906 in the Lompoc and Guadalupe districts.

The deposits are variously known as infusorial earth, tripoli, diatomaceous earth, and, in Santa Barbara County, "chalk rock." The most appropriate of these names is diatomaceous earth, as the material is composed almost entirely of the skeletons of minute organisms called diatoms—one-celled plants that adapt themselves to a wide range of conditions of depth and temperature in fresh or salt water and secrete siliceous casings around their organic matter. They must have lived in great abundance in the sea that ages ago covered this part of the land, for the rock was built up of the little shells of these plants that dropped to the sea bottom. Examination with a hand lens always reveals a large number of the round forms of the diatom shells thickly imbedded in the shale. Many of these shells are in a good state of preservation, and in some of the material they can be plainly distinguished with the naked eye. The name "chalk rock" is inappropriate, for although the deposits resemble chalk in appearance, they are made of siliceous instead of calcareous material.

The uses to which the diatomaceous earth are put are constantly increasing, and the methods of application are developing. Formerly employed solely for abrasive purposes, it soon became useful in the manufacture of polishing powders, soaps, etc.; but its abrasive quality makes it a good absorbent and it is extensively used in the manufacture of dynamite from nitroglycerine. Being very light and a poor conductor of heat, it is valuable for use in the manufacture of packing for safe, steam pipes, and boilers, and of fireproof building materials. It also serves as a base for the manufacture of cement suitable for withstanding heat. It is a good filtering substance and is so used commercially. Some of the earth from the Lompoc region is said to be used in the refining of beet sugar. In the Lompoc region and also at Monterey, farther north on the California coast, it is used in the construction of buildings. The shale is easily quarried into smooth blocks which can be readily placed in position. The blocks are compact and yet elastic under changes of temperature, seem to possess sufficient strength, and are very resistant to weathering. As a building material it is finely adapted to a region subject to earthquakes, for the shock effect on a substance so light would probably be the minimum and a smaller amount of damage would result from falling materials. The Santa Barbara County deposits are rendered exceptionally valuable by their proximity to railroad and ocean transportation facilities.

The paper referred to includes descriptions of the various occurrence of the diatomaceous earths, a discussion of their physical and chemical properties, and statistics of production in the United States. It may be obtained by applying to the Director, United States Geological Survey, Washington, D.C.

MINING IN THE BOUNDARY DISTRICT

Mr. Frederic Keffer, the president of the Canadian Mining Institute, and engineer of the British Columbia Copper Company, contributes an interest article to the current number of *The Engineering Magazine*. on "Mining in the Boundary District." While, naturally, the information given is not all new, the subject is treated for, perhaps, the first time in a manner at once concise and comprehensive. Mr. Keffer points out that four general conditions have contributed to the successful mining and smelting of the low grade ores of the district, these being: (1) The enormous extent of the ore bodies, admitting of mining on a large scale; (2) the solidity and firmness of the ground which renders the opening of great stopes without the use of timbers feasible and safe; (3) the chemical composition of the ores, which, by rendering them self-fluxing, obviates the use of any barren fluxes; and lastly, the presence in the near neighborhood of coal areas, by which a cheap and abundant supply of fuel is made available. Had any one of these conditions been absent, it is questionable whether mining in the Boundary could have been profitably carried on. The district enjoys the advantage also of an abundant water and timber supply, while the mines generally are dry and require little pumping.

The mining methods employed are two, one by open pits or "glory holes," and the other by pillars and stopes. The former may only be employed where the overburden of soil rock is not too great, and is most effective in mines where the dip of the ore deposit is high. But, owing to the low dip of many of the deposits, glory hole work is necessarily limited, and, as square-set timbering in underground work is imposible on account of the prohibitive cost, the usual plan is to open stope above a roof supported by pillars of ore.

The writer notes that the great irregularity in form of the deposits necessitates that each section of the work, even in the same mine, must be treated individually, and plans made to suit the form and dip of the ore contained in that section.

In the British Columbia Copper Company's Mother Lode Mine the ore is all conveyed to the main shaft, where it is dumped into pockets. The cars mostly used have a capacity of from 2 to 2 1-2 tons, and are drawn by horses in trains of from 4 to 5 cars. The ore is drawn from the pockets into 5-ton skips, and hoisted to a bin at the surface, whence it passes to electrically driven Blake crushers. From the crushers the ore falls on to a conveying belt, which carries it to the railway bins. At the Granby Mines most of the haulage is done by electric motors and steam locomotives, bins being located at two tunnel entrances to the mine on the upper levels. Here the ore is crushed in crushers with jaw openings of 30 and 42 inches, and then passed to railway bins. The ore from the Dominion Copper Company's mines is delivered directly to the railway bins without crushing.

Steam power has been practically displaced in the Boundary by electricity, which is generated at Cascade and Bonnington Falls. The capacity of the former plant is 2,000 to 3,000 horse-power, while the larger plant at Bonnington is capable, it is estimated, of generating 60,000 horse-power at low water.

The progress of mining in the Boundary is indicated by a comparison of the tonnage of ore smelted in 1900, which was 62,389 tons, and the returns for last year, 1,276,589 tons.

RICHNESS OF COBALT ORES*

By Dr. Albert R. Ledoux, New York.

I have been asked by several members of the Institute what is the grade of Cobalt ores, as determined by my sampling works in Jersey City. Since January, 1905, we have handled at our works 366 carload lots of this ore, and 52 other lots—less than carloads—including what we call nuggets, the nuggets either coming separately consigned or as part of a carload. I do not feel at liberty to state the assays of any particular lots of nuggets, as there have been some delicate questions concerning the value of some of these "Bonanza shipments." These nuggets, as you are aware, are not pure silver, but run anywhere from 700 parts to 870 parts of silver in the thousand. There are more or less gangue and other minerals associated with the silver, and the metallic silver itself, visibly free from gangue, runs about 950 fine.

Leaving out of consideration the nuggets and native silver, and including only the lots of regular ore, a review of 394 lots sampled shows that the highest lot ran 7,402 ounces of silver to the ton, the next in order being 6,909, 6,413, 6,163 and 5,948 ounces per ton. In the 394 lots we found:

							Per cent.
Over	6,000 ozs.				4 lots	(say)	1
Between	5,000 ozs.	and	6,000 ozs.		3 lots	(say)	0.75
Between	4,000 ozs.	and	5,000 ozs.		12 lots	(say)	3
Between	3,000 ozs.	and	4,000 ozs.		17 lots	(say)	4.25
Between	2,000 ozs.	and	3,000 ozs.		30 lots	(say)	10
Between	1,000 ozs.	and	2,000 ozs.		72 lots	(say)	18.25
Between	900 ozs.	and	1,000 ozs.		11 lots	(say)	2.75
Between	800 ozs.	and	900 ozs.		7 lots	(say)	1.75
Between	700 ozs.	and	800 ozs.		12 lots	(say)	3
Between	600 ozs.	and	700 ozs.		21 lots	(say)	5.25
Between	500 ozs.	and	600 ozs.		10 lots	(say)	2.5
Between	400 ozs.	and	500 ozs.		13 lots	(say)	3.25
Between	300 ozs.	and	400 ozs.		20 lots	(say)	5
Between	200 ozs.	and	300 ozs.		44 lots	(say)	11.25
Between	100 ozs.	and	200 ozs.		66 lots	(say)	17
Less than	100 ozs.	and			43 lots	(say)	11

You are of course aware that while the greater part of shipments of cobalt have come to New York, some have gone abroad and many have gone to Copper Cliff.

It seems to me that this is a remarkable showing for a camp so young as Cobalt, the first car having reached our sampling works about the first of February, 1905.

Silver, of course, in point of value, is the more important element. The highest percentage of cobalt found in any one shipment is 11.96 per cent., the average being 5.99 per cent. The highest assay for nickel in any car is 12.49 per cent., the average being 3.66 per cent. The highest percentage of arsenic is 59.32 per cent., the average 27.12.

Discussion.

Mr. Campbell—Could you tell us, in the case of these nuggets and of the silver, what it was which makes them less than one thousand fine?

Dr. Ledoux—There are mixed up with the nuggets other minerals; sulphides, arsenides, etc., and the gangue matter. We have paid no attention as to what reduces the fineness of the native silver—we do not know what it is.

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*The above formed the subject for a brief address by Dr. A. R. Ledoux, following the reading of papers on the Cobalt District at the Toronto meeting, 1907.

PRODUCTION OF COAL IN 1906

According to statistics compiled for the United States Geological Survey by Edward W. Parker, coal mining expert in charge, the total production of coal in the United States in 1906 was 414,039,581 short tons of 2,000 pounds, valued at $512,610,744. These figures, compared with those of the preceding year, when the output amounted to 392,919,341 short tons, valued at $476,756,963, show an increase of 21,120,240 short tons, or 5.4 per cent. in quantity, and of $35,853,781, or 7.5 per cent. in value.

Of the total production in 1906, Pennsylvania contributed 200,546,084 short tons, or 48.4 per cent., in quantity, and $262,182,935, or 51.1 per cent., in value, the larger percentage in the value being due, of course, to the higher value of anthracite, which is produced almost exclusively in that State.

The anthracite production of Pennsylvania in 1906 was 63,645,010 long tons (or 71,282,411 short tons), valued at $131,917,694, while the bituminous production was 129,263,673 short tons, valued at $130,265,241. The anthracite production of Pennsylvania in 1906 was 5,694,142 long tons (or 6,377,439 short tons) less than that of 1905, with a dcrease in value of $9,961,306, while the bituminous production showed an increase of 10,850,036 short tons in quantity and of $16,874,734 in value.

One of the interesting facts presented in the statistics of coal production last year is that West Virginia has supplanted Illinois as the second coal-producing State, West Virginia showing a total output of 43,276,485 short tons, while the production of Illinois was 41,497,435 short tons. This was due principally to the almost complete suspension of mining in Illinois (as in other States where labor union forces were strong) during all of April and a part of May, when the miners and operators were in conflict over the wage scale, whereas the majority of the operations in West Virginia were more actively worked, as a result of the suspension of work in the other districts.

Notwithstanding, however, the loss of from six to eight weeks in the States where mining operations were suspended, there was a general increase in production east of the Mississippi River, the only exceptions noted being in Michigan, Georgia, and North Carolina. In Illinois, where the question of the wage scale is most sharply contested, the production increased from a total of 38,434,363 short tons in 1905 to 41,497,435 short tons in 1906. Indiana's production of coal increased from 11,895,252 short tons in 1905 to 12,084,281 short tons the following year. Ohio's production increased from 25,552,950 short tons in 1905 to 27,729,843 short tons in 1906, while the bituminous production of Pennsylvania increased from 118,413,637 short tons in 1905 to 129,263,673 short tons in 1906.

In West Virginia, where there was no suspension of mining, the output of coal increased from 37,791,580 short tons in 1905 to 43,276,485 short tons in 1906.

Among the other coal-producing States in which there was an increased production in 1906 were Alabama, Colorado, Iowa, Kentucky, Maryland, Montana, New Mexico, Tennessee, Virginia, Washington, and Wyoming. In addition to the three States previously named in which decreases occurred, the following showed losses in tonnage: Arkansas, Indian Territory, Kansas, Michigan, Missouri, Texas, California, Oregon and Alaska. In California, Oregon, Arkansas, Indian Territory and Texas the decreases were due principally to the use of fuel oil. In Kansas, Michigan and Missouri the decreases were due, in the main, to the fact that in these States the industry did not recover from the idleness previously referred to.

PRODUCTION OF COAL IN 1906, BY STATES.

State.	Production.	Value.
Alabama	13,107,663	$17,467,886
Arkansas	1,864,518	2,999,774
California and Alaska	30,831	78,684
Colorado	10,114,074	12,738,509
Georgia and North Carolina	363,463	407,247
Idaho and Nevada	6,165	24,238
Illinois	41,497,435	44,742,440
Indiana	12,084,281	13,105,168
Indian Territory	2,859,450	5,481,053
Iowa	7,321,639	11,688,598
Kansas	6,010,858	8,935,195
Kentucky	9,673,536	9,794,823
Maryland	5,434,528	6,473,829
Michigan	1,336,338	2,402,529
Missouri	3,755,778	6,163,449
Montana	1,787,934	3,186,620
New Mexico	1,963,558	2,635,571
North Dakota	300,998	437,894
Ohio	27,729,843	30,386,297
Oregon	79,731	212,338
Pennsylvania:		
Anthracite	71,282,411	131,917,694
Bituminous	129,263,673	130,265,241
Tennessee	6,262,686	7,682,121
Texas	1,160,707	2,058,731
Utah	1,773,847	2,411,992
Virginia	4,275,815	4,207,521
Washington	3,276,184	5,908,434
West Virginia	43,276,485	40,777,382
Wyoming	6,138,152	8,019,486

The calorimeter is an instrument of value in the hands of a trained chemist. For any given class of coals it gives an excellent standard of comparison. But when a large number of determinations are to be performed on coals of widely differing composition, it is often necessary to correct and adjust results. This means that each fuel develops its own "error" and a correcting factor must be found for each. Results obtained by means of the calorimeter must not be considered absolute. Relatively they are correct. But unless refinements are introduced, making the work too tedious and elaborate for commercial purposes, it is not desirable that comparisons based upon calorimeter results should be instituted between coals of different characters.

The same general truth applies to commercial laboratory work. While the determination of some of the elements is simple and should always be accurate, there are operations, such as the volumetric determination of sulphur in pig iron, where a constant error is observable. Exactness is here sacrificed for speed. So long as the error is constant no harm need be done

GEOLOGICAL SURVEY OF CANADA

PROPOSED DISTRIBUTION OF FIELD PARTIES, SEASON 1907.

YUKON:

Messrs. McConnel and Maclaren.—An examination of the mineral areas of the southern portion of the territory, including the copper deposits of Whitehorse and the rich silver deposits of Conrad.

Mr. Cairnes—The mapping and investigation of the coal areas along the Yukon River, between Whitehorse and Tantalus.

Mr. Keele—An examination of the upper waters of the Pelly and Hoole and Kiza Rivers, extending over two seasons, the return journey to be made across the mountains, and thence to Dawson by the Mackenzie, Rat and Porcupine River route.

BRITISH COLUMBIA:

Mr. J. A. Bancroft—Continue the examination of the rocks and minerals northward from Texada Island, giving particular attention to the copper and iron deposits.

Mr. Leach—Continuation of the mapping and investigation of the coal and copper areas in the vicinity of the Bulkley Valley, Skeena River.

Mr. Camsell—Continuation of the mapping and geological investigation of the Similkameen valley.

Messrs. Brock and Boyd—Completion (in two or three weeks) of the Rossland, or continuation of the mapping and geological investigation of the Lardeau camp. If possible, investigations in the Slocan district.

ALBERTA:

Mr. Malloch—Continuation of the mapping of the Cascade, Palliser and Costigan coal fields in the Rocky Mountains, between the Red Deer and Clearwater Rivers.

SASKATCHEWAN:

Mr. McInnes—Examination of the country lying to the north of the Canadian Northern Railway, and extending to the north of the Saskatchewan River to 50° N. lat. The east and west boundaries being lines drawn through Prince Albert and The Pas.

ONTARIO:

Mr. Collins—Continuation of the study of the geology and economic minerals along the route of the N. T. Ry., in the western part of the Province.

Mr. W. A. Johnston—Continuation of the mapping and geology of the Simcoe sheet.

QUEBEC:

Mr. Morley Wilson.—Continuation of the mapping and geological investigation in the western portion of Pontiac County east of Lake Temiskaming.

Mr. W. J. Wilson—Continuation of the mapping and geological investigation of the belt along the N. T. Ry., eastward from the crossing of Bell River.

Mr. O'Sullivan—Mapping and geological investigation of the belt along the N. T. Ry., from La Tuque westward.

Mr. Dresser—Study of the serpentines of the Eastern Townships, with special reference to the mode of occurrence in them of the valuable deposits of chrome iron ore, asbestos and copper.

NEW BRUNSWICK:

Dr. Ells—Continuation of the revision of the geology of Southern New Brunswick.

Mr. Robert—Continuation of the mapping and geology in the environments of the City of St John.

NOVA SCOTIA:

Mr. Fletcher—Continuation of the mapping and geological investigation in Kings, Annapolis, Digby and Cumberland Counties.

Messrs. Faribault and O'Farrell—Continuation of the mapping and geology of the gold-bearing rocks in Lunenburg and Queen's Counties.

Dr. Young—Investigation of the granites and other irruptive rocks, with special reference to the occurrence of tin and other valuable minerals.

SPECIAL WORK.

Mr. Ingall—Investigation of the copper resources of Eastern Canada.

Mr. Denis—Superintendence of the selection of samples of coal at the mines for the practical coal tests. Study of each mining centre for information to accompany the report on the tests.

Prof. Macoun—Collection of specimens illustrating the forest wealth of Canada for the new Victoria Museum.

Messrs. Willimott and McKinnon—Collection of mineral specimens for High School collections and for the Victoria Museum.

Mr. R. A. A. Johnston—Special duty of rare minerals in various localities.

Dr. Ami—Study and collection of fossils in Nova Scotia and New Brunswick to determine geological horizons.

BOOK REVIEWS

THE METALLURGY OF THE COMMON METALS—gold, silver, iron, copper, lead and zinc—by Leonard S. Austin, Professor of Metallurgy and Ore-dressing, Michigan School of Mines, first edition. Published by *The Mining and Scientific Press*, San Francisco. Price $4, postage, 16 cents; 407 pages, 6 inches by 9 1-4 inches.

This volume outlines, in a manner at once comprehensive and connected, the metallurgy of the metals mentioned in the title. It is divided into ten sections. Part I. is general. The definition and classification of ores is followed by brief, singularly lucid paragraphs on the metallurgical treatment of ores, combustion, fuels, refractory materials, sampling, preparatory treatment of ore, and thermo-chemistry as applied to metallurgy. This whole section displays a wide general acquaintance with the basic principles of metallurgy. None but a man of ripe experience could crystallize into words definitions so succinct and so informing.

Part II. deals with the general principles of roasting and with certain specific applications of those principles. To the chemistry of roasting four pages are devoted. Heap and stall roasting of lump ore are taken up, and the mechanical roasting of ores in a pulverized condition is very carefully, though of course briefly, developed. One meritorious feature of this section and, indeed, of every section of the book, is the care taken in specifying figures of capacity and costs

Parts III. and IV. cover the metallurgy of gold and silver. Instructive diagrams of the stamp mill accompany these sections. The pages describing the cyaniding of gold and silver ores have been revised and modified by Mr. F. L. Bosqui, a most eminent authority on the

process. Both parts are profusely illustrated with diagrams and photagravures. Parts V., VI., VII., VIII. and IX. take up iron, copper, lead, zinc and refining, respectively. In each of them the practical is wedded to the theoretical. Perhaps the most valuable section is Part X., which is headed "Commercial." In logical sequence the various steps in the establishing of a metallurgical industry are taken up, from location of works to the marketing of ores and metals.

We have read Professor Austin's volume, not only with interest, but with decided pleasure. So skilfully has the kernel of each subject been extracted, and so simple and comprehensive is the author's presentation of each, that it is impossible not to feel instructed and edified after a perusal of this excellent though unpretentious book.

CORRESPONDENCE

Bruce Mines, Ont., June 8th, 1907.

The Editor THE CANADIAN MINING JOURNAL,
Toronto.

In your June number the article entitled "Reciprocity" appeals to the writer forcibly, and for the benefit of those who may fall into similar errors it may be of interest to place on record how easily mistakes can be made in the treatment of ores, especially those of an auriferous nature, which, in appearance, are similar to those from which former experience has been acquired, and yet when put to the test of milling the result is entirely different. The writer having erected two stamp mills in South America, and made a very good recovery by battery and plate amalgamation, afterwards in Australia handling ore which was cyanided after being stamped, had the management of a considerable area in the Philippine Islands placed in his charge—this was in 1893-96, before the American war.

After making several hundred fire assays, development work was commenced, and samples taken every week across each heading, a quantity equal to two pounds weight of ore being broken for each foot in width; after a little practice this was done very fairly, and, there not being any gouge, the samples were representative. After drying the ore, it was ground by hand on an Indian rubbing stone by means of another stone. The ore was washed in a "batea"—the native wooden pan—by an expert panner, and the resultant gold fused into a small bead in the half of a species of sea shell; this was done by means of a a bamboo blowpipe on a few bits of charcoal. The lime in the shell acted as a flue, and the resultant bead was about 820 fine. In those days we could not get any acids carried by the coasting steamers, hence parting the gold was out of the question.

A continuous series of samples, aggregating two tons, showed rather more than $15 per ton, and there was present some pyrites which carried good values.

Now having a three-quarter ounce proposition of apparently free milling ore, it was considered safe to erect a ten stamp mill, and we proceeded to select a site where the tailings could be accumulated for future treatment. I will not dwell upon the difficulties of handling the machinery and erecting it, but it was done, and a mill man sent from the United States, who had been in charge of the Father de Swet Mill at Homestake, S.D., but do what we would, or could, the recovery in the battteries and on the plates did not average more than $2.75. We put in blanket strakes and saved concentrates going from 5 to 15 ounces of gold.

After making a most careful examination of everything, we came to the conclusion that whilst the abrasive action of the grinding by hand liberated the gold so that it could be saved in panning, the pounding action of the stamps flattened the gold, and it was carried off by the water without coming in contact with the amalgamated surfaces, and this in spite of mercury traps, etc. Ever since this experience the writer has been very chary of advocating stamp mills not followed by cyanide.

To add to his annoyance a report was circulated, and finally reached the ears of the managing director, resident in Manila, that the gold had been recovered but stolen! Fortunately, mill records had been carefully kept, and all amalgam weighed and the gold smelted and weighed in the presence of two or more of the white employes.

Now, how this may be applied to the present day is evident. Much of the ore to be treated from the new discoveries of Larder Lake, etc., cause the same disappointment, and perhaps this warning will be of service to those who are loking forward to results based upon assays, and the opinion of the writer may be taken for what it is worth, viz., that in many instances, especially for friable ores, the improved Huntingdon mill, or any other type in which grinding or abrasive action as opposed to stamping, will yield better results for those working on a small scale who wish to get quick returns with a minimum of expenditure. It should be remembered that the primitive form of the arrastra has produced many million dollars worth of bullion.

Yours obediently,

H. J. CARNEGIE WILLIAMS.

EXCHANGES

The Mining Investor, June 3rd, contains a caustic letter from "Critic."

The British Columbia Mining Record for April is, as usual, entirely readable and reliable.

The Coal Trade Journal, May 29th, announces that it has removed its offices to Nos. 20, 22 and 24 Vesey street, New York.

The Mining and Scientific Press, May 25th, gives a third instalment of "Letters of a Self-Made Miner to His New Foreman."

The Mining World, June 1st, gives a sketch of the oil fields of Colorado. The second installment of "British Columbia Placers: Past and Present" makes most interesting reading.

The Engineering Magazine for June contains several articles dealing with power and production. The system of mining low grade copper ores in the Boundary District, B.C., is described by Mr. Frederick Keffer, president of the Canadian Mining Institute.

The April number of *Economic Geology* has been received. In it are a number of most valuable articles. Especial mention may be made of the following: "The Composition of Coals," "Magmatic Emanations," and "Recent Improvements in the Utilization of Coal."

In *The Engineering and Mining Journal* for June 1st are articles on "Zinc Oxide and Zinc Lead Pigment Manufacture," and on the "Novel Equipment of Tywarnhaite Copper Mine." The latter paper describes an installation of dynamos driven by power from producer gas engines and the vacuum process of concentrating low grade copper ore.

The Industrial Advocate, May, prints a letter from Mr. Louis N. Fuller, general manager of the Dominion Mining & Smelting Company, of Pictou, N.S. Mr. Fuller rightly urges the claims of his enterprise for Government help in the direction of low freight rates. Each number of the *Advocate* contains valuable information corncerning the gold mines of Nova Scotia.

The Colliery Gaurdian, May 24th, in concluding a strong editorial touching the "Report of the Eight-Hour Day Committee," characterizes the movement as "but one phase of that rather selfish class individualism which has always been a characteristic feature of the coal miners of Great Britain." This issue contains also a second instalment of a paper on "Coal Analysis from the Commercial Point of View."

The Mining Journal (London), May 25th, comments editorially upon the recently issued annual report of the Nova Scotian Department of Mines. Of gold mining in that Province The Mining Journal justly remarks: "On the other hand, gold mining has been in progress since the early sixties, yet the rate of production is less than that which the small community of Australian settlers in New Guinea have reached in a few years. The report, even making allowance for inadequate resources, is certainly not an encouragement to outside capital, as it should surely be possible to collect similar returns from all sources, collate them and present complete and harmonious figures for such data as are afforded to the public." We need add nothing to our contemporary's criticism. It is, unfortunately, as true as it is incisive.

The Iron and Coal Trades Review for May 24th contains a translation of an article from Glückauf entitled "Judging Coke from its Appearance. The difference in the structure of coke made from various coal and under different conditions is well illustrated by means of photographs. Incidentally, a photograph of a speciment labelled "Metallic coke from unwashed coal produced in Canada" appears in the course of the article. It is credited with 38.48 per cent. ash, and the text explains that this coke comes from Sydney, Cape Breton, where it is used with entire success. Of course, this is utterly incorrect. There is no Nova Scotian coke that contains anything approximateing the absurd figures given in the matter of ash. Such a fuel, indeed, would be a commercial impossibility. The Sydney coke, on the other hand, rarely exceeds 10 per cent. in ash content, and is usually below that figure. We have mentioned this at some length, because a totally wrong impression is unintentionally given by the writer of the article referred to.

SPECIAL CORRESPONDENCE

Nova Scotia.

In common with the rest of the Dominion, Cape Breton has experienced a very backward spring, and the month of May was remarkable for the exceptional ice conditions that have prevailed in the Gulf of St. Lawrence, the Cabot Straits, and along the shores of Cape Breton. The drift ice is stated to have been heavier than at any time during the past thirty years, and both Louisburg and Sydney have been blocked for days together; in fact, Sydney Harbor was full of ice on the 3rd of June. In consequence, the shipments of the Dominion Coal Company have been much restricted, being almost 70,000 tons behind the corresponding month of 1906. The mines, however, did not lose any time from this cause. The output and shipments for May this year are approximately as follows, the corresponding figures for 1906 being also given.

Output and shipments for the month of May (approximate):—

Output.	1907. Tons.	1906. Tons.
No. 1	47,314	49,778
No. 2	57,592	52,186
No. 3	34,380	33,291
No. 4	41,538	50,761
No. 5	70,031	55,686
No. 6	18,362	7,859
No. 7	.....	15,024
No. 8	22,090	22,761
No. 9	34,964	36,431
	326,271	323,777

Shipments, 1907, 284,330 tons; 1906, 357,509 tons.

Glace Bay.

The Emery Seam, containing 4 feet 2 inches of good clear coal, underlaid by 5 inches of fire-clay, has been proved by a Calyx drill hole put down by the Dominion Coal Company on their property near No. 6 Mine at Big Glace Bay. The seam was met with at a depth from the surface of 222 feet. A previous borehole in this neighborhood was sunk in the near vicinity of a small dislocation, and did not show the exact thickness of the seam, as proved at other points. The present section shows the continuity of the measures under Big Glace Bay Pond, and there can be no doubt that the Emery Seam will prove a good second to the Phalen Seam at all of the Coal Company's mines. In all probability it will become entirely a longwall seam, and has a future before it.

Quebec.

An engineer who has just returned from a visit to the Eastern Townships, speaks in very glowing terms not only of the gratifying results attending the operation of the established mines, of which the general public hears litttle or nothing, but of the great potentialities of the section as a copper-producing area. Last year no less a sum than, in round figures, a million and a half dollars, was distributed in dividends, this representing the profits of five properties only. Of these mines, two are producing copper, the ore averaging perhaps $30 a ton for all values. The Nichols Chemical Company utilize their ores primarily for the manufacture of sulphuric acid, of which a large and increasing production is made; while another concern, the Eustis Company, is earning very handsome returns on the shipment of copper ore, carrying also fair gold and silver values. There is probably no district in Canada where, having regard to the capital originally invested, so good a showing has been made as in the Eastern Townships.

A press despatch announces the sale of the Eagle Mining Company's Golconda Mine, situated at Ascot, near Little Magog Lake, to a New York syndicate, for $60,000.

The Shawinigan Water & Power Company's transmission line from Shawinigan to Thetford, a distance of 97 miles, has been completed, and was recently carried to Black Lake, six miles distant from Thetford. It is now proposed to extend the line to Chrysotile. The first mine in the district to use electric power

was the American Asbestos Company at Black Lake, at whose property a plant was installed towards the close of 1904, and power supplied by the St. Francis Electric Power Company. Both the Bell Company and Messrs. King Bros.' mills are operated by electricity, and the Beaver Asbestos Company's property is now being equipped with an electric plant. It is anticipated that a majority of the asbestos and chrome iron mines of the district will utilize electricity for power requirements in the near future.

A small experimental plant has been installed by Mr. Kerr, of Boston, at one of the properties owned by the Black Lake Chrome & Asbestos Company, near Coleraine Sttation. A larger plant, it is expected, will be provided later, development having satisfactorily demonstrated the potentialities of the area.

At the mine and mill near Chrysotile some thirty men are employed under the direction of Mr. John Penhale. This property has meanwhile been acquired by Providence, R.I., manufacturers.

The foundations for the large 300 ton mill, in course of erection at the property of the Dominion Asbestos Company at Black Lake, are now in place, and it is expected that the mill itself will be completed in readiness for operation before October next.

The Dominion Asbestos Company has acquired from the Standard Asbestos Company some two hundred and seventy-five acres of valuable asbestos-bearing territory.

At the Standard Asbestos Company's property eighty men are employed in and about the mine and mill; and recently a new cyclone pulverizer and ore dryer was installed to provide for an increased production of mill fibre.

Production of crude asbestos is being made from the Manhattan and the Montreal and Glasgow Mines, which have been purchased by the American Asbestos Company. The milling material is being treated in the large mill erected by the company some years ago. Meanwhile the Montreal and Glasgow Company's old mill is being dismantled. This mill is of historic interest, as it was the first to be built in the district for the mechanical separation of asbestos.

All the big mines at Thetford, the Johnson, Bell, King's and Beaver, are being worked to full capacity; and some new, rich ground has been unexpectedly opened up at the Bell asbestos mine, while driving the incline tunnel to connect the mill with the big quarry.

Considerable activity is expected to be shown in the near future in the East Broughton district, where recently a number of promising properties have been acquired by companies. Among others, the property adjoining that owned by the Quebec Asbestos Company on the east, has been purchased by the Frontenac Asbestos Company, who purpose shortly erecting a mill thereon.

New rich territory is reported to have been opened up on the Quebec Asbestos Company's mine, while the asbestos fibre now being produced is of excellent quality.

The additions and improvements to the Broughton Asbestos Company's milling plant are now about completed, and when operations commence production should be at least twice as great as formerly.

The asbestos area between the Quebec Asbestos and the Broughton Asbestos Company's mines has been acquired by a Mr. P. Augers and associates, who are erecting a mill designed to treat 250 tons of rock per day. The machinery is to be in readiness for the commencement of operations by September next.

Cobalt.

Professor Mickle is in town, and, with the inspectors, is arranging the summer work. It is the purpose to confine their attention at the present to the Montreal River district. A recorder's office has been opened in Latchford, with Professor A. McPhail, of the School of Mines, Kingston, in charge. An assay office will be opened in connection, for the convenience of the mining inspectors.

The firm of Evans & Laidlaw, mining engineers and assayers, Cobalt, have opened offices at Latchford and Larder Lake.

Since the snow has gone and trenching in earnest has begun, almost every day new finds are reported. Last week one of the largest veins in the camp was uncovered on the Nipissing, from which a nugget weighing over seven hundred pounds was taken.

The same vein has also been traced into the McKinley-Darragh property.

The Buffalo has uncovered some more high grade veins.

Work is progressing rapidly on the Peterson Lake property. It is the intention of this company to lower the lake some fifteen feet, and, as it is very shallow, a great deal of rock will thus become exposed. Already a number of veins have been uncovered on the shore allowance.

Professor Miller is in town, accompanied by Mr. Cyril Knight, geologist. They intend to devote their attention to geology of the Montreal River district, while Professor Brock, of Queen's University, will work out the rock formation in the Larder Lake region.

BRITISH COLUMBIA.

Atlin.

Atlin miners are much incensed at J. M. Ruffner, manager of the Pine Creek Power Company and the North Columbia Gold Mining Company, two district compaines jointly operated, for bringing in Japanese. Mr. Ruffner insists that he could not obtain sufficient white labor, so had to employ Japanese. Several meetings have been held, with the result that it has been determined to form a Miners' Protective Association, with the following objects: To oppose the invasion of the camp by Japanese; to induce white men to decline to work for any company employing Japanese, and to help those caused hardship thereby; and to so influence all dealers and merchants as to prevent them from catering for the trade of any company so long as it shall employ Japanese.

The suits of the Pine Creek Flume Company against the Pine Creek Power Company, and North Columbia Gold Mining Company, respectively, relative to the right to enter upon and work claims of an area of 36 acres, are now before the British columbia courts.

Information has been received from Paris to the effect that the Otter Hydraulic Gold Mines Company had been formed in that city for the purpose of hydraulic mining on Otter Creek. It is stated locally that the ground to be worked covers five miles, and is situated in the neighborhood of Otter Creek and Surprise Lake.

East Kootenay.

Work has been resumed at the Crow's Nest Pass collieries. The number of miners is not yet nearly sufficient for the increasing demands for coal, but efforts are being made to secure more for both collieries of the Crow's Nest Pass Company, viz., at Coal Creek and Michel. Coke is again being shipped to Kootenay and Boundary smelters, which will soon be in receipt of plenty to keep them going at full capacity.

A new mine is being opened up between Coal Creek and Fernie by the Crow's Nest Pass Coal Company, which is also giving attention to the cannel coal also occurring near Coal Creek.

At both lead-silver mines—the St. Eugene and Sullivan—operations are being continued with vigor, and a large output of ore is being maintained. At the St. Eugene particularly there is much activity, with increasingly large bodies of ore being developed to induce the Consolidated Mining & Smelting Company, owning this big lead-silver mine, to enlarge its production.

ROSSLAND.

After lengthy negotiations looking to that end, an amalgamation of the Giant and California interests has been effected, and the recently incorporated Giant-California Mining Company has commenced operations under the direction of Mr. W. Yolen Williams, who, prior to devoting all his time and energies to the opening up of the Granby Company's big mines at Phoenix, Boundary district, had the supervision of the work done on the California mine, which is situated west of mines of the Le Roi and Le Roi No. 2 Companies, which, during the last year or two, have been so successfully operated in Rossland camp. When the Giant was being worked several years ago, some 4,300 tons of ore were shipped from it, so that the value of its ore in bulk is known. The ore showings in both mines are good, so it is believed the new enterprise will be successful, especially under the conditions that it has ore bodies believed from experience to be payable, and the equally important essential of competent and careful management.

The installation of the big hoist has been completed at the Centre Star mine, and the group of which this mine is the centre is at last furnished with ample hoisting facilities. The hoist is a Nordberg 1,150 horse-power engine, having cylinders 28 x 60, drums 10 feet diameter x 5 foot face, and capacity 1,350 tons in ten hours from a depth of 3,000 feet, using 4 1-2 ton skips in balance. Ordinary speed when hoisting is 2,500 feet per minute. Brakes, reversing gear and clutches are operated by auxiliary engines. Corliss valve is controlled by a governor. Hoisting cable is of 1 1-4 inch steel. The engine is set on massive cement-concrete foundations, and is housed in a frame building 53 x 56 feet, erected for its protection.

BOUNDARY.

The output of ore from Boundary district mines during the month of April totalled 117,907 tons, in the following proportions:—

	Tons.
Granby Company's mines	70,518
British Columbia Copper Company's mines	22,890
Dominion Copper Company's mines	13,289
Snowshoe mine	11,030
Small high grade mines	180
Total	117,907

The average tonnage for four months of 1907 to April 30th, inclusive, is as under:—

Month.	Tons.
January	60,003
February	53,965
March	100,219
April	117,907
Total	332,094

The West Kootenay Power & Light Company, with head office in Rossland, has purchased the hydro-electric plant and other assets of the Cascade Water Power & Light Company. The former company has for years been engaged in generating electric power at Lower Bonnington Falls, on the Kootenay River, eleven miles below Nelson, and has supplied power and light to the Towns of Nelson and Rossland, and to mines and smelters in the Nelson and Trail Creek districts. The Cascade Company has made developing power for four or five years at Cascade, on Kettle River, and has supplied power and light to several Boundary district towns, mines and the Granby smelter at Grand Forks. Last year the West Kootenay Company commenced to carry out contracts it had succeeded in making in the Boundary with some of the larger users of electric power, viz., the smelters, but failed to obtain legislative sanction to its action in entering territory the exclusive right to operate in which had been granted to the Cascade Company. As the West Kootenay Company, now that its new generating station at Upper Bonnington Falls is completed, is in a position to supply much more power than is at present required, while the Cascade Company at times had difficulty in meeting district requirements, the purchase lately concluded appears to have been in the best interests of both the companies concerned and the district at large.

COAST.

Dr. Porter, Professor of Mining, and Dr. Stansfield, Professor of Metallurgy at McGill University, accompanied by some of the students of the McGill Summer Mining School, which had just completed a field course in the Kootenay and Boundary districts, arrived in Victoria on May 24th on a few days' visit to the capital. Dr. Stansfield took advantage of the opportunity to go up to Ladysmith and look over the Tyee Copper Company's copper smelter there. He was shown around by the superintendent, Mr. W. J. Watson, a former McGill student.

Mr. R. R. Hedley has been in Victoria conferring with the Provincial Mineralogist, Mr. W. F. Robertson, as to the most effective method of gathering information concerning the mining and smelting industries of the West, in furtherance of the plan of the Dominion Department of Mines to obtain for publication reliable data relative to mines, mills, smelters etc. It is stated that Mr. Hedley is to collect the required information in British Columbia, Alberta, Saskatchewan and Manitoba. This work is an undertaking involving a considerable amount of time and trouble, as will be realized more fully before much progress with it shall have been made. Its great practical usefulness is, thaugh, ample warrant for its having been authorized.

GENERAL MINING NEWS

NOVA SCOTIA.

During the investigation of the miners' trouble at Springhill, N.S., a question arose as to the application of the Lemieux Act, to a subsidiary branch of the mine operations in which only six men are employed, and the Minister was asked for an interpretation of the law as applicable to the case. The Hon. Mr. Lemiux replied as follows: "My understanding of the intention of section 21, of Industrial Disputes Investigation Act, is of the numbers of employes directly or indirectly affected by a dispute is ten or more, the dispute may be referred to a board, though the persons to whom it may directly relate are fewer in number than ten. If the failure to effect a settlement in regard to a matter affecting directly only six men is likely to result in ten or more being either immediately or subsequently affected, the reference of such a dispute would, in my opinion, come very properly within the provision of the Act."

It is reported that negotiations are in progress for the sale of the Nova Scotia's Stteel & Coal Company's general stores and dwelling houses at Sydney Mines to a local syndicate. The value of the property is roughly estimated at half a million dollars.

Iron ore mining at Torbrook, Annapolis County, is very active. Mr. F. Burrows, the local manager, is beginning to sink the new shaft on the Martin Farm, and is conducting railway construction work.

Coal shipments from Cape Breton collieries to Montreal are already 100,000 tons short of what they were this time last year. This amount can hardly be made up before winter sets in again.

The Dominion Iron & Steel Company created a new record in the matter of blast furnace output for the month of May. The month's total output of pig iron from the three stacks now in blast totalled 28,128 tons, as against the previous record of 23,003 tons.

The first exportation of copper matte in the history of the Maritime Provinces was made on May 20th from the Pictou smelter. Twenty-five thousand and sixty-three pounds were shipped tto New York.

Sydney Mines, May 30th.—On account of the extraordinary ice conditions prevailing in North Sydney Harbor, the collieries of the Nova Scotia Steel & Coal Company are temporarily closed. This put 2,500 men out of work. About 100,000 tons of coal are banked ready for shipment.

The Maritime Coal, Railway & Power Company have acquired the property of the Canada Coal & Railway Company in Cumberland County.

Sphinghill.—On May 30th the Conciliation Board met in Truro. Mr. Archibald represented the Cumberland Coal & Railway Company. Mr. Justice Graham was chairman. Two questions were up for settlement. On one of these the board agreed, deciding in favor of the men. No agreement could be reached on the second point by the three arbitrators. The session was therefore postponed until June 27th. The point gained by the men had to do with the pay of workers at counter level crossings on No. 14 chute. The rate of pay was raised from $1.23 per day to $2.44. The second point hinges upon the men's claim of 4 cents for areas of an inch by a yard. The chairman held that in 1894 an agreement was made for 2 cents a box, and that this is still binding. Each of the three members of the board holds a different view.

Ontario.

Operations on Loon Lake Iron Mines are soon to be commenced.

At the O'Brien Mine, Cobalt, two men were killed by an explosion of dynamite on June 3rd.

The Algoma Steel Company announces that it will commence at once the erection of a large blast furnace. The furnace is to cost $1,000,000, and will be the largest in Canada. Coke ovens will also be erected. The building of a new furnace has become essential because of the high price of American pig iron.

The Mining Recorder's Office for the Montreal River Division was opened on May 30th. Mr. Alex. McPhail is in charge.

An air compressor is being installed at the Government workings on the Gilies Limit.

In a south cross-cut, at a point 250 feet southwest from the original 49 strike, a new vein, rich in silver, has been discovered on the Nipissing.

The Evans Mine is making a shipment of cobalt ore to Wales. A French syndicate controls a reduction plant there.

On Monday, May 26th, a prospector named Peter Leclair was killed by the T. & N. O. yard engine at Cobalt.

The Rat Portage Diamond Drill Company have commenced drilling on the Hamilton property at Stobie Falls.

The Clover Leaf Copper Mine, near Grassy Lake, in the Larder Lake District, is owned by a Pennsylvania syndicate. It has produced about 150 tons of fair ore. The ore has never been shipped. Adjoining this property a Toronto syndicate has purchased a number of claims and will operate them this summer.

The Gamey property of 40 acres, near the Coniagas Mine, has been purchased by the Cobalt Central Mining Company.

Alberta.

A Commission has been appointed to investigate the car shortage and to inquire into the conditions existing among the coal miners of the Province. The Commission consists of the Hon. A. L. Sifton, Chief Justice of the Supreme Court, chairman; Mr. Louis Stockett, manager of the Bankhead coal mines, and Mr. Hansom, a working miner, belonging to Coleman. Sittings will be held in all the leading coal mining centres of the Province.

The coal mine operators of Bankhead have advanced the price of coal at the mines by 15 per cent. This is rendered necessary, they claim, by the advanced rates of miners' pay.

Mr. Chas. P. Hill, manager of the Hillcrest Coal Mine at Hillcrest, Alberta, refused to sign an agreement taking back into his employ the striking miners. Mr. Hill claims that the new wage schedule leaves him absolutely no room for profit.

In Edmonton rumors are still flying around concerning the discovery of gold in the Yellowhead Pass of the Rocky Mountains.

The miners employed by the Alberta Railway & Coal Company have made application to the Federal authorities for the appointment of a board of investigation and conciliation to enquire into alleged grievances, which are stated to be the general condition of employment, wages and hours of work. The Minister of Labor has consented to appoint a board, and the company has been notified to name its representatives.

British Columbia.

On the Rose Gulch Hydraulic Company's property, adjoining the Cariboo Consolidated, in Cariboo District, newly discovered ground breasts out fully six feet of pay dirt, with a width of 75 feet. One monitor only is at work on the new property.

The Rambler-Cariboo Mine will begin shipping ore in the first week of June. Ore has not yet been struck on the 1,400 foot level.

The Bowen Island Copper Company has sunk a prospecting shaft, 60 feet, in what appears to be a strong, true fissure vein, containing a good grade of chalcopyrite. A drift has been run 50 feet on the lead. A working shaft will now be sunk. This property is within twenty miles of the City of Vancouver.

The British Columbia Copper Company, Greenwood, was able to tide over the coke shortage of last month. Superintendent McIntosh has now about 200 men employed at the Mother Lode, in Deadwood Camp. The new crusher for this company's mine at Oro Denoro is being installed.

The Tip Top Mine, east of Greenwood, has been purchased at a cash price, reported to be about $10,000.

Dr. J. Bonsall Porter, with a large party of McGill mining students, has visited the principal mining camps of British Columbia. Many of the students will remain here for the summer. They have secured temporary positions.

The Sullivan Group Mining Company, Kimberly B.C., with mines at Kimberly and a 125 ton smelter at Marysville, seven miles distant from the mine, owns and operates the Heberlin process for roasting ore before smelting. The smelter capacity is soon to be increased to 150 tons daily. During April the smelter turned out 521 tons of bullion, worth $50,000.

A new ten drill air compressor has been started at the Ymir Mine.

The demand for coal continues to be far in excess of the supply at the Vancouver Island and Puget Sonud coal mines.

Boundary District miners, smelter men and laborers have been given substantial raises in pay. All underground men get a fifty cent raise. Surface men will get 10 per cent. increase on present pay. Smelter day laborers will receive $3 per day of nine hours. In other departments an increase of from 25 to 50 cents is granted.

Suit has been brought against F. Augustus Heinze by the Canadian Pacific Railway. Mr. Heinze owns 600,000 acres of timber lands and coal fields in British Columbia. The C. P. R. is trying to compel Mr. Heinze to take title of his land in order that the railroad may then proceed with the development of other properties after Mr. Heinze has definitely designated the exact boundaries of his own.

The Golden Eagle Mine is reported to have been sold to a Vancouver syndicate for $60,000. The Golden Eagle is in the North Fork district and was originally owned by Christopher Tobiason. Five years ago an English syndicate took a bond of the property for $75,000, but the bond lapsed.

Mr. D. R. Irving left Victoria on May 18th to take charge of the operations of the Berry Creek Hydraulic Mining Company.

The extensive iron ore deposits of Texada Island are to be reopened. Mr. James A. Moore, of Seattle, is behind the movement. The ore is to be shipped from Gillies' Bay, where a deep-water wharf is being built, to the Irondale smelter on Puget Sound.

On May 22nd a large seam of coal was discovered near Wellington. The seam is seven feet deep.

Hydraulicking was commenced near Barkerville, Cariboo, on May 4th.

At No. 4 Mine, one of the largest of the Wellington Colliery Company's mines at Union, B.C., a serious fire broke out on June 1st. The mine, which employs about 700 miners, will have to be flooded. The mine is approached by a slope.

YUKON.

Mr. A. J. Beaudette, Territorial Engineer for the Yukon, in a report gives the following particulars and costs of thawing ground for dredging operations on Bonanza Creek:—Wood used per 24 hours, 5 1-2 cords; cost of wood per cord, $13.50; labor, 2 shifts, 3 men per shift, $40; cubic yards thawed per 24 hours, 400; cost per cubic yard for thawing, 28.5 cents. Notwithstanding this substantial addition to dredging costs in the Yukon, due to the frozen condition of the gravel throughout the season, dredging operations in the Territory have so far yielded fair returns.

Catalogues and Other Publications Received

The Allis-Chalmers-Bullock's Bulletin No. 201 deals with "Lidgerwood Hoisting Engines for Mining Purposes."

The catalogue of R. H. Buchanan & Company, 234 Craig street west, Montreal, has been received. This firm makes a specialty of pumps and pumping machinery. They handle the Pulsometer steam pumps and the Rider-Ericsson hot air pumping engines.

An attractive catalogue, received from the Cleveland Car Company, West Park, Ohio, presents much information and many illustrations pertaining to industrial and narrow gauge railway equipment. Many designs in trunnion, two-way, bottom, end, one-side, either-side, rotary and other varieties of dump cars are manufactured by this firm.

Bulletins 741, 756, 703, 103, 106, 712, have been received from the Jenckes Machine Company, Limited, Sherbrooke, Que. In these the Jenckes Company's hoisting engines, standard iron cars, "special cableway" engines, vertical tubular boilers, locomotive type boilers and "special" hoisting engines are illustrated and described. Their hoisting engines are of especial interest.

Surveying and Other Instruments of Precision (semi-centennial edition, 1857-1907), issued by Hearn & Harrison, opticians, 10-12 Notre Dame street east, Montreal. This catalogue illustrates and describes the microscopes, telescopes, hydrometers, thermometers, hygrometers, surveying, meteorological and nautical instruments, drawing instruments and accessories manufactured and imported by this celebrated firm.

Catalogue G, from the Blaisdell Company, engineers and manufacturers, 334 Pacific Electric Building, Los Angeles, California; New York office, 2600 Park Row Building, describes the Blaisdell Pressure Filter. This filter is devised for dewatering mill pulp and separating cyanide solution and wash water from the slime. It consists of three parts; a series of filter leaves; a pressure cylinder, and pumps for vacuum, slime, water and solution, with pipes and valves. The process is continuous. One operator on each shift can control one or more filters and handle a large tonnage. Skilled labor is unnecessary, owing to the simplicity of the installation. The filter is adapated to any variety of slime. The various sizes range in capacity from 12 tons of dry slime per day to 500 tons per day. The manufacturers invite prospective purhcasers to send 50 pound sample of dry slimes for testing at their plant, with a view to ascertaining their requirements.

From the Power & Mining Machinery Company, Cudahy, Wisconsin, have been received a number of catalogues and pamphlets. In their catalogue No. 5 there is presented a description of gold and silver milling machinery. A very useful set of general specifications for a ten-stamp gold mill is given on pages 73-75. Catalogue No. 6 deals with "Roasting, Smelting and Refining." The first part of the catalogue takes up the "Preparation of Ores for the Smelter." Then follow descriptions of the standard machinery, furnaces and complete equipment used in roasting, smelting and refining for the recovery of precious metals. Gas power plants are also handled by this firm. In the same catalogue the American-Crossby Suction Producer Plant is described. It is recommended for requirements up to 500 horse-power, where charcoal, coke or anthracite pea coal may be purchased at reasonable figures. For powers of 500 horse-power and greater, the Loomis-Pettibone Gas Generating System in connection with gas engines is recommended.

PERSONAL AND GENERAL

Mr. N. Timmins, of Cobalt, was in Sudbury during the latter part of May.

Mr. B. F. Pearson, of Halifax, N.S., one of the chief promoters of the North Atlantic Collieries Company, spent a few days in Toronto recently.

Mr. W. Stanley Lecky, head of Messrs. Mussens, Limited, mining machinery department, has returned to Montreal after an absence of some weeks in England.

Mr. W. Yolen Williams, formerly mine manager for the Granby Company at Phoenix, has been appointed superintendent of the Giant-California Company, Rossland, B.C.

Mr. J. A. Dresser has been retained by the Director of the Geological Survey to do special geological work for the Department this season in the Eastern Townships.

Mr. A. P. Low, Director of the Geological Survey of Canada, has been appointed Deputy Minister of Mines. Mr. Low will retain the former post in addition to his new duties.

Mr. A. A. Hassan, mining geologist and consulting engineer, is making the King Edward Hotel, Toronto, his temporary headquarters while engaged in examining various districts around and near Cobalt.

The imports of nickel in ore and matte to the United States in 1906 were 15,156 tons, containing approximately 18,500,000 pounds of metallic nickel, valued at $1,816,631. These figures show a material increase over the returns for 1905.

Mr. Erik Nystrom, of the staff of the Mines Branch, has received instructions to investigate the peat industries of Holland, Norway, Sweden, Denmark, Finland and Germany, and prepare a full report on the subject for the Department. He sails for Europe immediately.

The forty-sixth general meeting of the Institution of Mining Engineers will be held in London on June 13th and 14th. We note that Mr. J. B. Tyrrell's paper on "Development of Placer Gold Mining in the Klondike District, Canada," will be open for discussion.

Dr. J. Bonsall Porter returned to Montreal on the 2nd inst. after an absence of some weeks in the West in charge of the annual McGill summer mining excursion. The excursion was an exceptionally successful one, visits being paid to Cobalt, Lethbridge, Frank, and the several mining districts of British Columbia.

Mr. A. A. Hayward, at one time manager of the famous Golden Lode Mine in Nova Scotia, and a past president of the Nova Scotia Mining Society, paid a visit to Toronto early in June. Mr. Hayward is a mine manager with an excellent record behind him. It is probable that he will make Toronto his permanent residence.

One of the recipients of the Carnegie Research Scholarships awarded recently by the Council of the Iron & Steel Institute, is Mr. C. A. Edwards, a Canadian by birth, who, however, gained his experience of foundry practice at Horwich, England, at the works of the Lancashire & Yorkshire Railway. Mr. Edwards is joint author of the Eighth Report to the Alloys Research Committee, and was recently appointed Research Fellow and Demonstrator in the Metallurgical Department of the University of Manchester, under Professor Carpenter.

STATISTICS AND RETURNS

Cobalt ore shipments for the week ending June 1st, 1907:—

	Pounds.
May 27th—O'Brien Mine, to Perth Amboy, N.J.	65,200
May 27th—Coniagas Mine to Perth Amboy, N.J.	54,300
May 28th—Coniagas Mine to Perth Amboy, N.J.	63,000
May 30th—Coniagas Mine to Perth Amboy, N.J.	62,000
May 27th—Nipissing Mine to New York	65,480
May 28th—Nipissing Mine to New York	64,790
May 30th—Nipissing Mine to New York	55,400
May 30th—Temiskaming and Hudson Bay Mine to Copper Cliff, Ont.	55,500
May 31st—Trethewey Mine to Perth Amboy, N.J.	63,200
	545,870

ROSSLAND ORE SHIPMENTS.

Shipments for the week ending June 1st: Centre Star, 1,960 tons; Le Roi, 2 910 tons; Le Roi No. 2, 2,455 tons; White Bear, 70 tons, milled, 350 tons. Total for the week, 5,745 tons, and for the year to date, 105,414 tons.

CROW'S NEST PASS OUTPUT.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ended May 31st was 21,504 tons, a daily average of 3,584 tons. For the corresponding week of last year the output was 20,835 tons, a daily average of 3,573 tons.

DOMINION STEEL.

It is reported that the output of the Dominion Iron & Steel Company at Sydney this season will be at the rate of 30,000 tons pig iron per month, as compared with 20,000 per month last year.

Shipments from the Springhill collieries of the Cumberland Railway & Coal Company for May amounted to 36,559 tons.

Shipments for week ending May 18th:—Centre Star, 2,185; Le Roi, 3,455; Le Roi Two, 315; White Bear, 95; White Bear (milled), 350. Total for week, 6,380, and for the year to date, 94,912. Trail smelter received 2,723 tons during the week, and Northport smelter, 3,455 tons.

Nelson, May 18.—The following are the ore shipments and smelter receipts in Southeastern British Columbia districts for the past week and year to date in tons:—

Shipments: East of Columbia River, week 2,509, year 44,785; Rossland, week 6,814, year 97,323; Boundary, week 3,620, year 370,392; total, week 12,943, year 512,500.

Smelter receipts: Grand Forks, week nil, year 207,822; Greenwood, week 3,500, year 96,777; Boundary Falls, week nil, year 94,147; Nelson, week 387, year 7,092; Trail, week 3,723, year 85,185; Northport, week 3,207, year 32,185; Marysville, week 600, year 12,000. Total, week 11,567, year 4z5,546.

BOUNDARY ORE OUTPUT.

Phoenix, May 23.—A compilation of figures regarding the ore output of the mines of the Boundary for the month was the best for more than half a year in the district, although May is falling down badly, on account of the coke shortage. Shipments from several mines of the Boundary that have been sending out ore are figured as follows, in tons:—

Granby mines		70,518
British Columbia Copper Company—		
Mother Lode	21,040	
Emma	1,470	
British Columbia Mine	40	
Morrison	340	
		22,890
Dominion Copper Company—		
Brooklyn	4,469	
Rawhide	5,024	
Sunset	2,626	
Mountain Rose	357	
Idaho	813	
		13,289
Snowshoe		11,030
Providence		110
Elkhorn		30
Strathmore		20
Duncan		20
April total		117,907

The Granby's record for April exceeded that for any month since last fall, and the British Columbia Copper Company's record is the highest in the history of the company. That of the Snowshoe, also, is a large one for that mine. As the British Columbia Copper Company is the only smelter having coke this month, the other two have been idle, and the May story will be a very small one.

The Boundary output by months, in tons, has been as follows:—

January	60,003
February	53,965
March	100,219
April	117,907
Total	332,094

WEEK'S ORE SHIPMENTS.

Week ending June 1st.

Boundary shipments—

Mine.	Week.	Year.
Granby	1,431	207,932
Mother Lode	4,520	84,217
Brooklyn	1,376	25,115
Idaho	300	1,196
Rawhide	1,275	26,756
Mountain Rose	105	1,942
Elkhorn	25	47
Other mines	.....	44,590
Total	9,032	385,795

Rossland shipments—

Mine.	Week.	Year.
Centre Star	1,608	36,142
Le Roi	1,608	54,808
Le Roi No. 2	517	9,397
White Bear	102	1,094
Other mines	.....	5,570

Kootenay-Slocan shipments—

Mine.	Week.	Year.
Sullivan	600	13,200
La Plata, milled	425	9,350
Queen, milled	185	4,070
Eva, milled	230	920
Whitewater, milled	300	750
Queen Victoria	2z7	1,858
Silver King	142	910
St. Eugene	445	6,280
La Plata	48	1,422
North Star	41	484
Silver Cup	32	407
Vancouver	42	324
Hunter V	56	2,079
Other mines	.....	8,469
Total	2,868	50,623

The total shipments from the mines in the above districts for the past week were 16,128 tons, and, for the year to date, 643,329 tons.

Week ending May 25th:—

Boundary shipments—

Mine.	Week.	Year.
Mother Lode	6,350	79,691
Solly	22	64
Other mines	.....	297,763
Total	6,372	376,763

Rossland shipments—

Mine.	Week.	Year.
Centre Star	1,447	34,534
Le Roi	3,012	52,807
Le Roi No. 2	535	8,880
White Bear, milled	350	2,200
White Bear	116	992
Other mines	.....	3,370
Total	5,460	102,783

Kootenay-Slocan shipments—

Mine.	Week.	Year.
Sullivan	600	12,600
La Plata, milled	425	8,925
Queen, milled	185	690
Whitewater, milled	300	450
Hunter V	79	2,023
Queen Victoria	126	1,561
St. Eugene	512	5,835
La Plata	54	1,374
Vancouver	41	282
Silver Cup	41	375
Payne	18	18
Whitewater Deep	64	259
North Star	164	343
Last Chance	31	325
Other mines	.....	7,710
Total	2,870	47,655

The total shipments for the mines in the above districts for the past week were 14,702 tons, and for the year to date 527,201 tons.

RAND GOLD OUTPUT.

The output of gold from the Transvaal mines in May, as estimated by Kaffir houses in London, was 500,000 ounces fine. This represents a decrease of 37,000 ounces from the April out-turn, but interference and forecast are difficult, owing to the strike in the Rand.

The value of the May output, roughly, is $10,625,000, as compared with $11,405,550 in April, $11,684,860 in December, the record month, and $9,795,310 in May a year ago. If this estimate proves correct, last month's output will have been the lightest of any month since last July, when 491,793 ounces were turned out. Prior to the Boer war, the high record of Transvaal production was $8,604,000 in August, 1899.

COMPANY NOTES

Tyee Copper (B.C.).—The report for April state: Smelter ran 13 days and smelted—Tyee ore, 880 tons; Customs ore, 2,121 tons; total, 3,001 tons. Matte produced from same, 269 tons. Gross value of contents (copper, silver and gold), after deducting costs of refining and purchase of Customs ore, $7,658.

Nearly the whole of the second vein allotment of British Columbia Copper Company stock was taken up by stockholders in the ratio of 30 per cent. of holdings. In January the management increased the company's capital from $2,000,000 to $3,000,000 by an issue of 200,000 shares, par value $5 each. At the present time there are 96,640 shares of unissued stock.

Le Roi No. 2 (B.C.).—In a recent report to the London office the manager states that he is confident that he has discovered the H vein on the 900 foot level. As yet the values are not as high as they were at the 700 foot level, where they averaged 2.75 ounces gold, but the new discovery is regarded as most promising. In view of this report the shares have advanced 3-16 on the London Market.

A gigantic gain in profits for 1906, dsepite a material falling off in production of metal, was shown yesterday by the Anaconda Copper Mining Company, in its annual report. The total production was z4,963,835 pounds, or 479,895 pounds less than in 1905. The company's gross profits from its sales of copper, silver and gold, however, aggregated $20,955,532, or $3,526,434 more than sales during the previous year. Its total receipts amounted to $26,968,870, or $3,234667 more than in 1906, while its total disbursements involved $18,384,870, $238,220 more, leaving a total net income of $8,842,669, or $3,123,341 more than the net earnings for the previous year. This net income represented 29.47 per cent. earned on the company's $30,000,000 of capital stock. Dividend disbursements at the rate of 28 per cent. involved $6,000,000, or $3,450,000 more than in 1905, leaving a surplus for the year of $1,942,669, or $326,159 less than at the close of the previous year. The company's profit and loss surplus, which amounted to $9,183,241, was equivalent to 30.61 per cent. on the outstanding stock.

NEW COMPANIES

The Vancouver Coal & Prospecting Company, Limited, capital twenty thousand dollars, divided into twenty thousand shares of one dollar each; Victoria, B.C.

The Combined Goldfields, Limited, the share capital to be three million dollars, divided into three million shares of one dollar each. Head office, Toronto, Ont.

The Eastern & Cobalt Mining Company, Limited, share capital to be one million dollars, divided into one million shares of one dollar each. Head office, Cobalt, Ont.

The East Bay Larder Lake Gold Mines, Limited, share capital to be one million dollars, divided into one million shares of one dollar eeach. Head office, Toronto, Ont.

The Empire Larder Lake Gold Mines, Limited, share capital to be one million dollars, divided into one million shares of one dollar each. Head office, Toronto, Ont.

The Rush Larder Lake Mining Company, Limited, share capital to be one million dollars, divided into one million shares of one dollar each. Head office, Toronto, Ont.

The Ontario Copper Company, Limited, share capital to be three million dollars, divided into six hundred thousand shares of five dollars each. Head office, Toronto Ont.

The Martin Larder Gold Mines, Limited, the share capital of the company to be one million dollars, divided into one million shares of one dollar each. Head office, Toronto, Ont.

The Anglo-Canadian Petroleum Company, Limited, incorporated under the laws of the Imperial Parliament of Great Britain and Ireland. Capital to be used in Ontario not to exceed $250,000.

The Maple Leaf Mines, Limited, non-personal liability, capital two hundred and fifty thousand dollars, divided into two hundred and fifty thousand shares of one dollar each; Victoria, B.C.

The James Township Silver Mines, Limited, share capital to be one mililon five hundred thousand dollars, divided into one million five hundred thousand shares of one doller each. Head office, Toronto, Ont.

The Ontario Exploration Company, Limited, share capital one million dollars, to be divided into one million shares of one dollar each, of which fifty thousand shares are to be preference shares. Head office, Bracebridge, Ont.

The Portland Canal Mining & Development Company, Limited, capital one hundred thousand dollars, divided into three hundred and twenty-five thousand shares of twenty-five cents each, and fifty thousand shares of twelve and one-half cents each; Victoria, B.C.

The Lake Superior Iron & Steel Company, Limited, the share capital of the company to be one million dollars, divided into ten thousand shares of one hundred dollars each. Head office, Sault Ste. Marie, in the District of Algoma, Ont. One of the objects of this incorporation is to manufacture and deal in iron, steel, nickel, and any other ore products of the mine and products thereof. Another is to manufacture charcoal and by-products, coke and by-products, and to deal in wood and the products thereof.

The following extra-provincial companies have been registered in British Columbia:—

The Bella Coola Copper Company, Limited, capital two million dollars, in shares of one dollar each, head office Spokane.

The Jewel Syndicate, Limited, capital twenty-five thousand pounds, in shares of one pound each, head office in Scotland.

The Falls Copper Mining Company, Limited, capital one million five hundred thousand dollars, in shares of one dollar each, head office Spokane.

The Alberta Fuel Company, Limited, capital one hundred thousand dollars, in shares of one dollar each, head office Spokane, State of Washington.

The Copper Mountain Mining Company (specially limited), capital five hundred thousand dollars, in shares of one dollar each; head office, Phoenix, Arizona.

METAL, ORE AND MINERAL MARKET

Aluminium, No. 1 grade ingots—46 cents per lb.

Antimony—15 to 18 1-2 cents per lb.

Arsenic, white—7 1-2 to 7 7-8 cents per lb.

Barytes, crude—$11.25 to $14.50 per short ton.

Bismuth—$1.50 to $1.75 per lb.

Cadmium—$1.40 per lb.

Carbons, for drills—$78 to $85 per carat.

Carborundum, powdered—8 cents per lb.

Chromium, metal pure—80 cents per lb.

Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.

Corundum—7 to 7 1-2 cents per lb.

Feldspar, ground—$9.75 to $10 per short ton.

Flourspar, lump—$10 per short ton.

Graphite, domestic—$50 to $150 per short ton.

Gypsum, lump—$4.50 per long ton.

Infusorial earth, ground—$15 to $30 per ton.

Lead—5.75 cents per lb.

Manganese, pure metal—75 cents per lb.

Mica, ground—$80 per short ton.

Mica, scrap—$15 per short ton.

Molybdenum, pure—$1.70 per lb.

Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.

Nickel—45 to 60 cents per lb.

Platinum, ordinary metal—$27 per ounce.

Pyrite, 38 per cent. to 45 per cent. sulphur, lump.

Quicksilver—$41 to $42 per 75 lb. flask.

Talc—$18 to $23 per ton.

Tungsten, pure metal—$1.25 per lb.

Tungsten ore, 60 per cent. pure—$400 per ton.

Tin—41 1-2 cents per lb.

Zinc Sheets—$8.60 per 100 lbs.

MARKET NOTES.

Northern pig iron, No. 1, ranges from $27 to $27.50. Bessemer malleable, $26 to $27.50. Bessemer ore, old range, $5. Bessemer, Mesabi, $4.75. Non-Bessemer, old range, $4.30.

Copper market is still unchanged. Lake copper, 24 1-4 to 25 cents per lb.; electrolytic, 23 to 23 1-2 cents per lb. The London market is unsettled, with a tendency towards lower prices. Standard, £99 1s. for spot.

Tin—There has been a marked fall in the price of this metal, apparently due to increased supplies. New York, 41 1-2 cents per lb; London, £187 per long ton for spot.

Lead—A decreasing demand has brought lead down to 5.75 cents per pound. The London market holds at £20.

Silver is moving upward. New York, 67 1-4 cents per ounce; London, 31d. Mexican dollars, 52 1-8 cents.

Spelter is steadier. New York, 6.47 1-2 cents per lb.; London, £24 10s. per long ton.

Cobalt, refined metal, $2.40 per lb.

The economic value of monazite lies in the incandescent properties of the oxides of the rare earths—cerium, lanthanum, didymium and thorium—which it contains. The cerium goes to the drug trade; the thorium, together with limited quantities of lanthanum and didymium, is used in the manufacture of mantles for Welsbach and other incandescent lights.

The zircon produced in 1906—all from Henderson County, N.C.—amounted at 1,100 pounds, valued at $248.

Mines and Minerals for June contains a leading article on "Montana Coal Mines." "An article on "Cobalt" is concluded from the May number.

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References:—Dr. R. Bell, Chief Geologist Dominion Geological Survey, Ottawa. The Molsons Bank, Port Arthur, Ont. The Mayor, Port Arthur, Ont. Prof. R. Carr-Harris, Royal Military College, Kingston, Ont. Board of Trade, Port Arthur, Ont. Board of Trade, Fort William, Ont.

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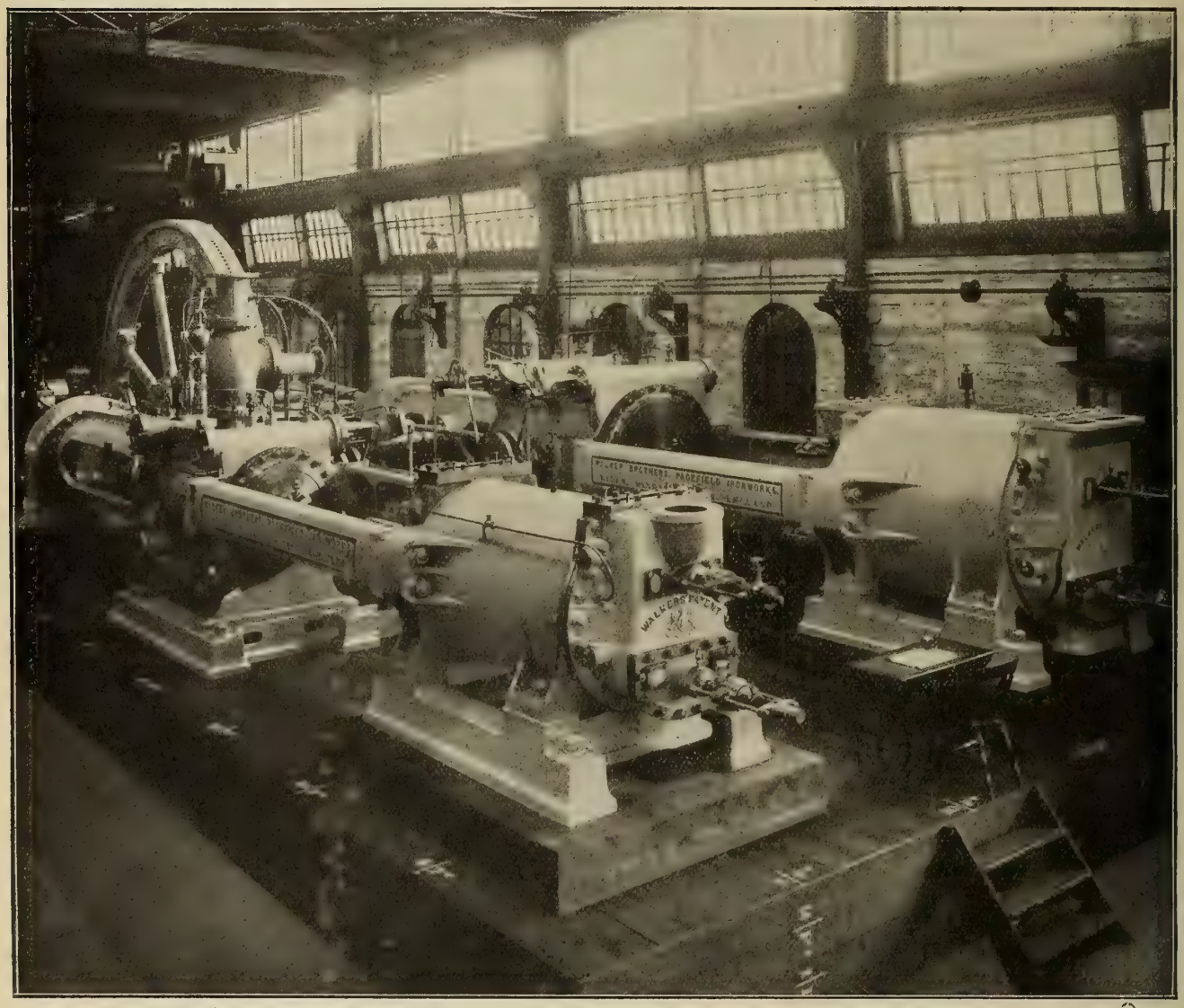
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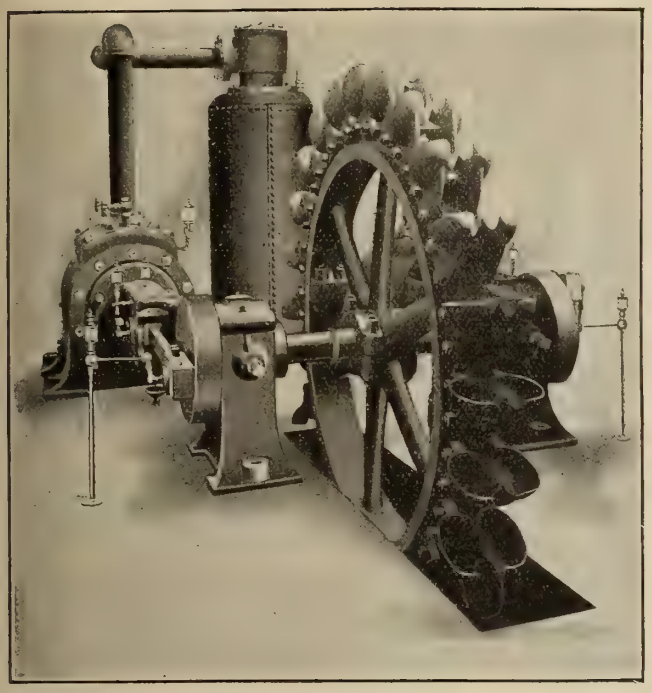
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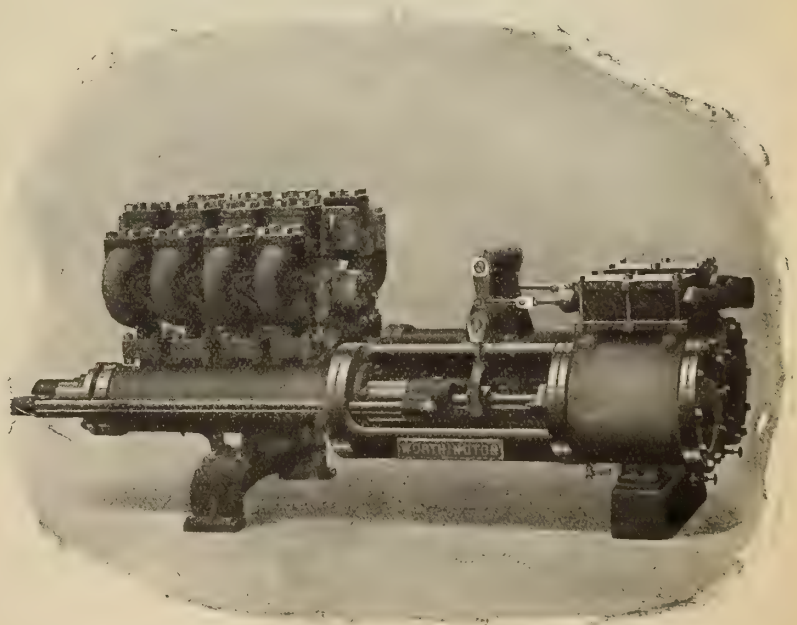
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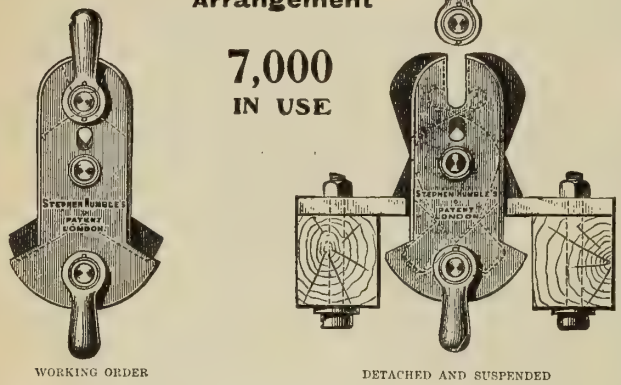
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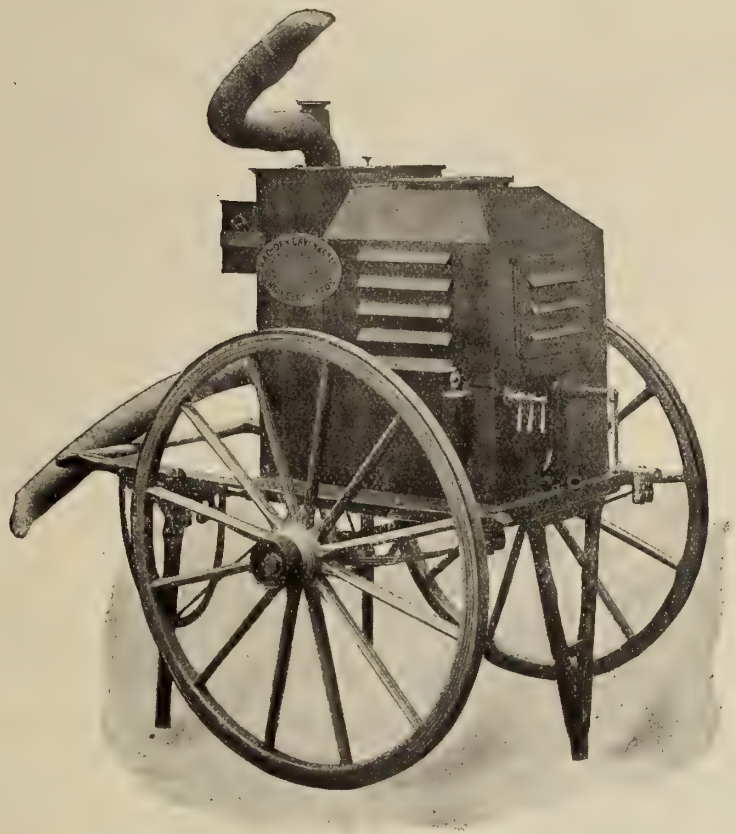
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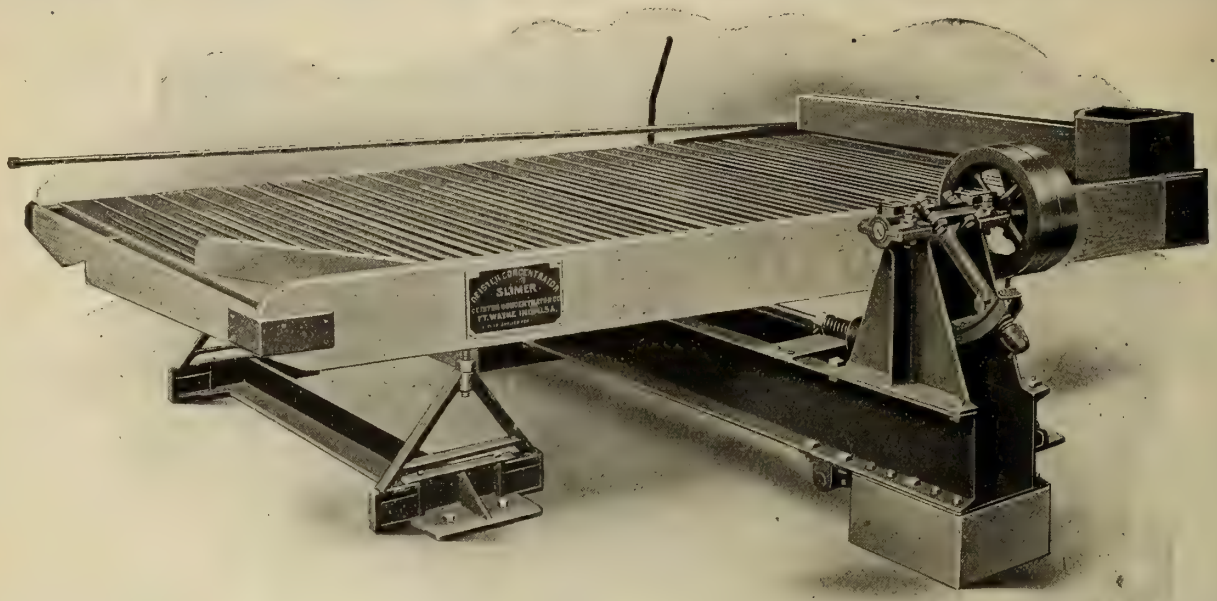
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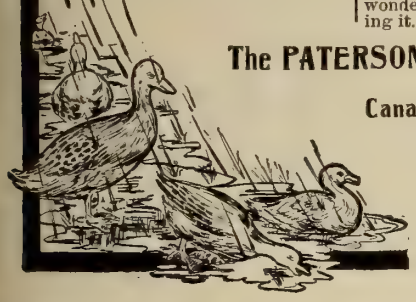
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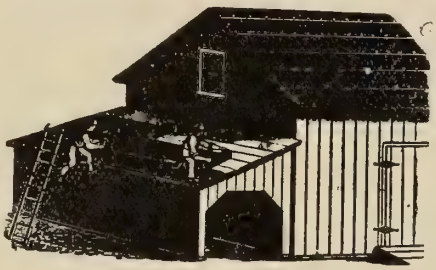
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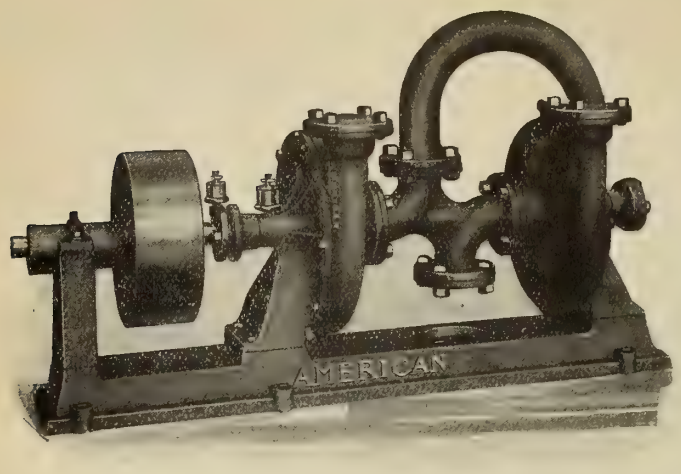
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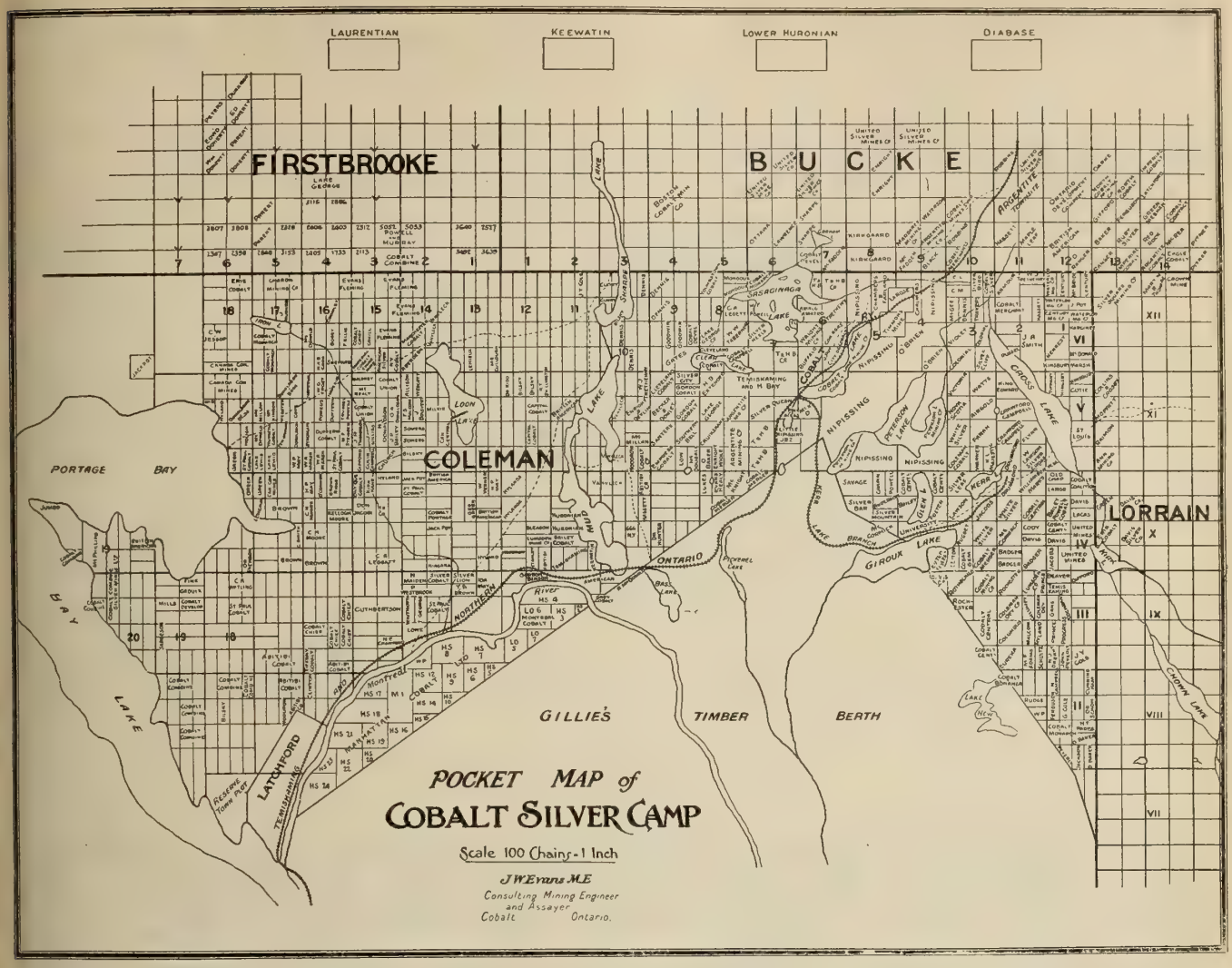
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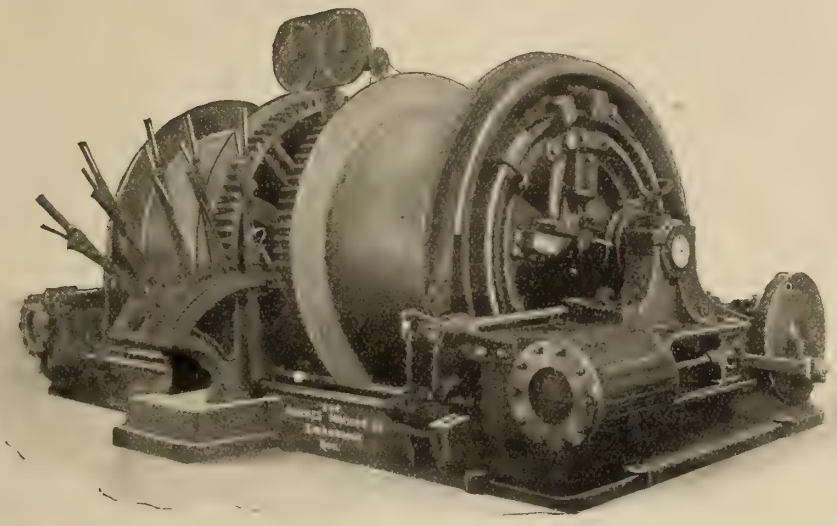
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John J. Gartshore

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Canadian Pacific Railway
Grand Trunk Railway
Quebec & Lake St. John Railway

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Elder-Dempster
Richelieu & Ontario Navigation Co.

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B. Greening Wire Co.
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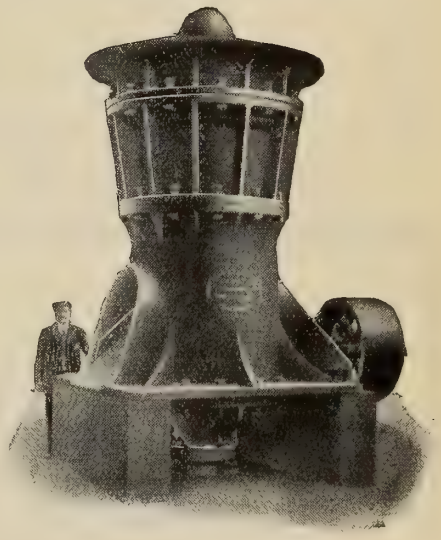
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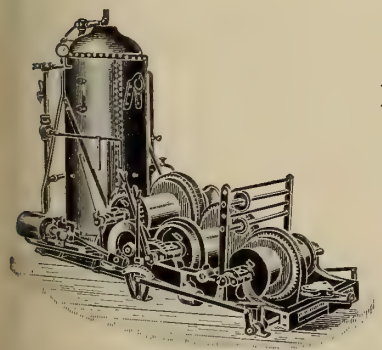
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to readers of this paper

1100 strong, serviceable English, Canadian and Scotch tweed suits, also English corduroy, suitable for business or town wear as well as for men who need strong clothes. Weights are medium and heavy. Regular prices run from $10.00 to $14.00. Sizes 35 to 44. We offer these suits to readers of this paper for **$7.95**

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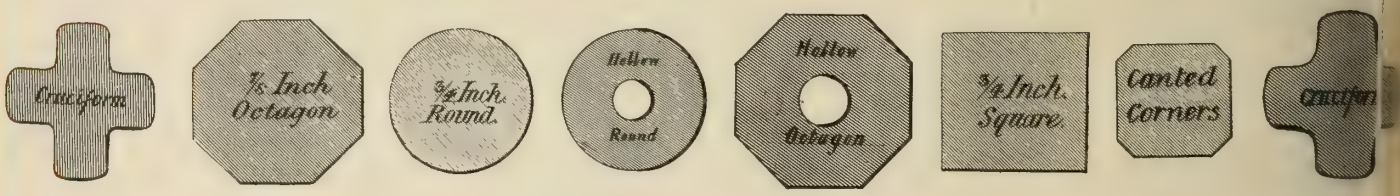
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The Canadian Mining Journal

I. No. 8 New Series TORONTO and MONTREAL Old Series, Volume xxvii. No. 10



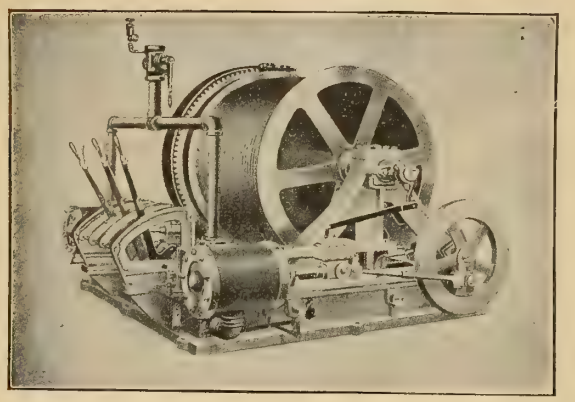
COPPER ORE FROM BRITISH COLUMBIA.

Pages of Special Interest

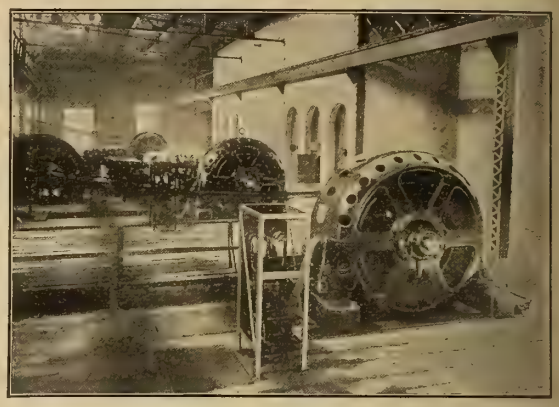
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WANT ADVERTISEMENTS - - - XVII
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BUYERS AND SELLERS OF METALS XXII and XXIII

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Purchasers may avoid the delays inevitable in dealing with half-a-dozen companies for different portions of their equipment and obtain better value by purchasing their entire equipment from One Company.



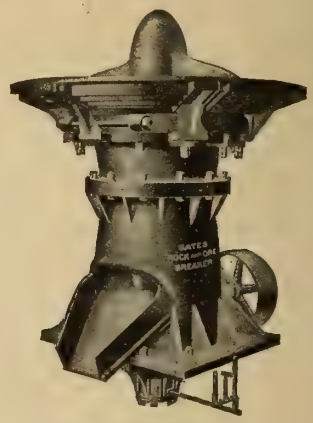
The "Lidgerwood" combined friction drum and brake and reversible link motion hoisting engine is the most economical yet made for mine hoisting.



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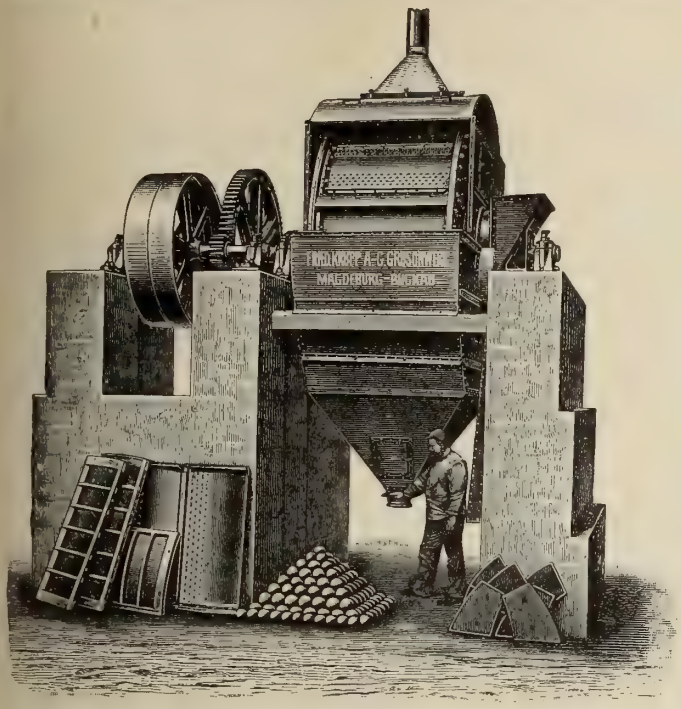
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FOR DRY AND WET CRUSHING

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Hardest ores ground to any degree of fineness.

Minimum wear and tear.

Easy access to the interior of the large grinding drum.

Require little attention.

MODERATE POWER, WITH HIGH CAPACITY

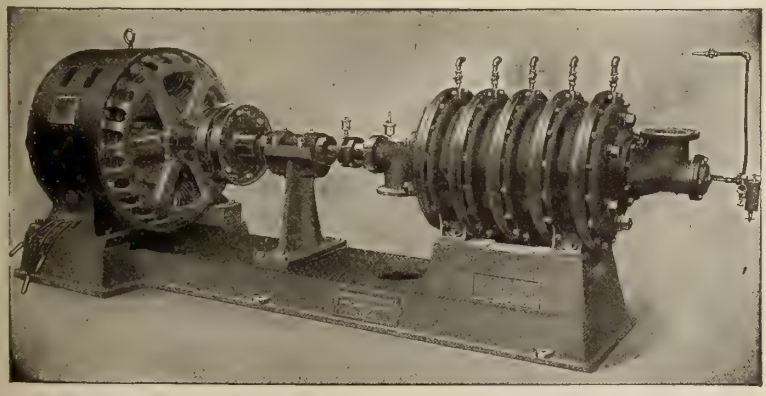
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what we have to gain by this kind debate. But it appears that othe think otherwise. Well, I will be there for those others."

NEW ORE CRUSHER AT WORK

WILL CRUSH 1,500 TONS OF KNOB HILL ORE EVERY 10 HOURS.

OPERATED BY ELECTRICITY SUPPLIED BY CASCADE POWER CO.

Phoenix, Jan. 23.—(Special to The Daily News.)—This week all the electric wire connections having been made, the new ore crusher, ordered last May by the Granby company, was started in operation. It has been ready for some time and only awaited the coming of the electric current from Cascade.

The initial run of the huge machine was eminently satisfactory to superintendent Williams, who will have it operated 10 hours daily, in which time it will crush 1,500 tons of Knob Hill ore. Later another machine of the same type will probably be installed at the Old Ironsides' ore bins.

The crusher is of the Blake-Farrell type and is the largest machine of its kind in Canada. The chilled steel jaws will take a piece of rock 36x42 inches in size, more than a cubic yard, and is fitted with swing jaw and pitman. It was furnished by the Jenckes Machine company, of Sherbrooke, Que. The freight on one of the several cars in the shipment was over $2,000

To operate the crusher a 100 horse power electric motor was secured from the Canadian General Electric company.

BRADSTREET'S REPORT

Conditions During the Week

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Largest Crusher in Canada

The newspaper clipping reproduced herewith refers to a 42" x 30" Crusher built by us for the Granby Smelter at Phoenix, B.C., being the first of four similar, counting one now under construction, built for this same company. The four Crushers have a total capacity of six thousand tons of rock every ten hours. They are the largest Crushers of the Jaw type in Canada.

WRITE FOR BULLETIN 602

THE

Jenckes Machine Co., Limited

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Transmission of Power, Logging and general Hauling and Hoisting Purposes.
Wire specially selected for own exclusive use.
We have made many records with our Winding, Haulage and Crane Ropes.

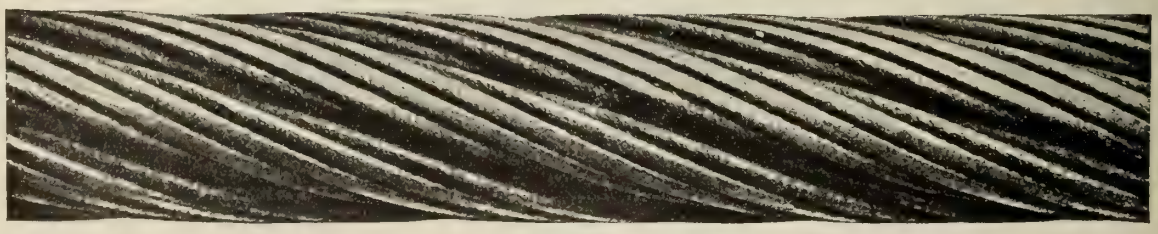


Illustration of **Winding Rope,** 240 fms. long x 3½ circ. Galvanized Special Improved Patent Steel. Compound Make, supplied to Kenneil Collieries, Bo'ness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

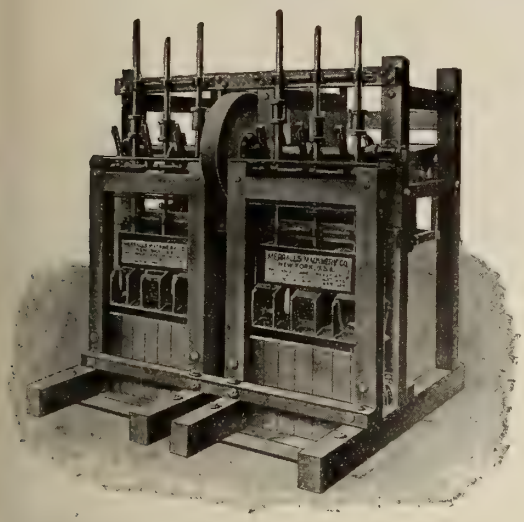
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Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3/8" to 1/4" Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel,, Forging of all kinds, Bright Compressed Shafting 5/8" to 5" true to 2/1000 part of one inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand

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COAL MINING





PRIMITIVE *VERSUS* PROGRESSIVE

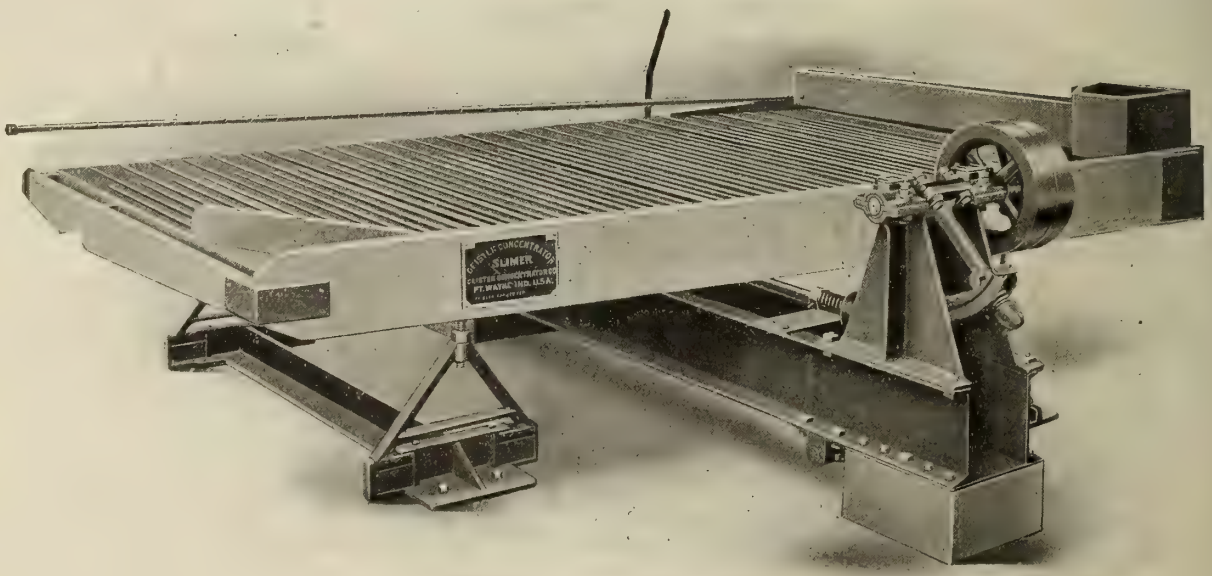
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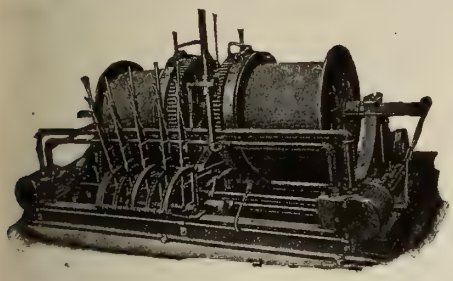
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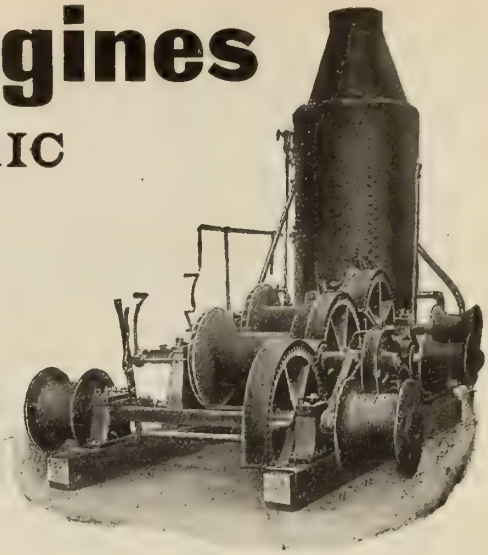
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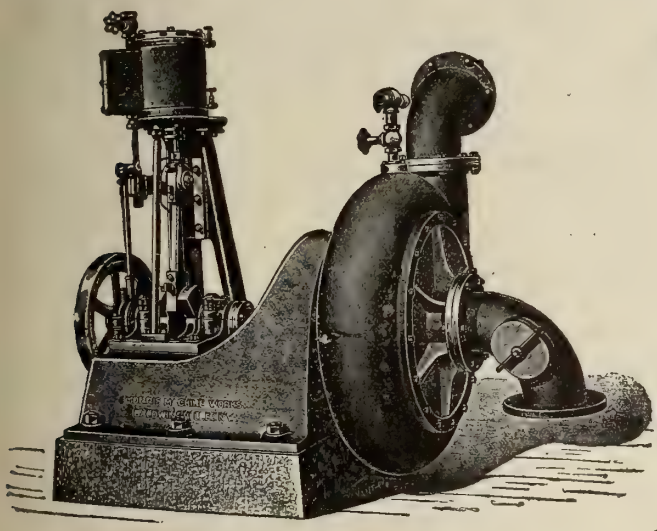
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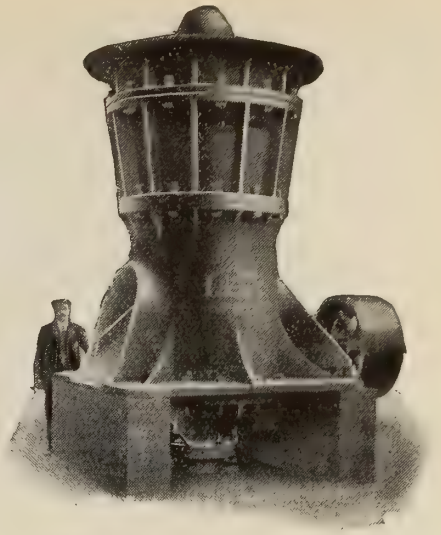
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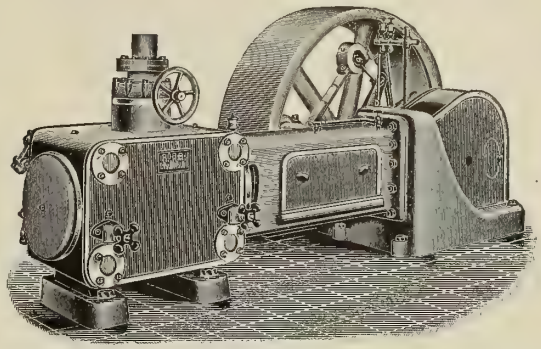
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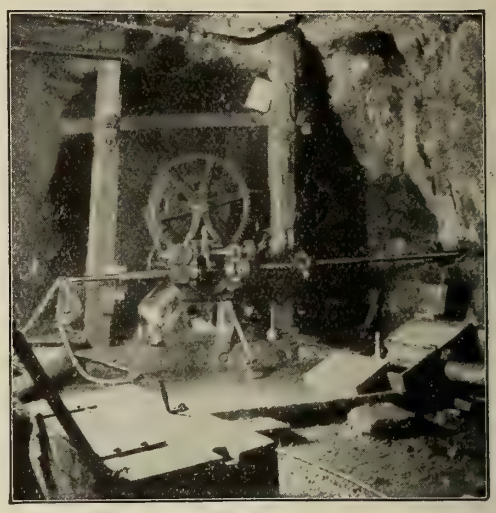
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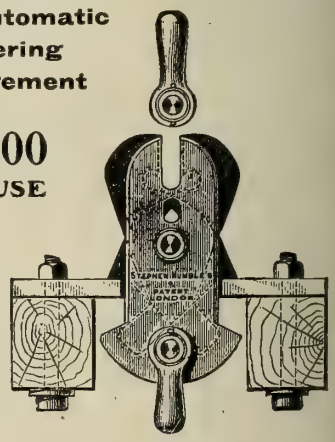
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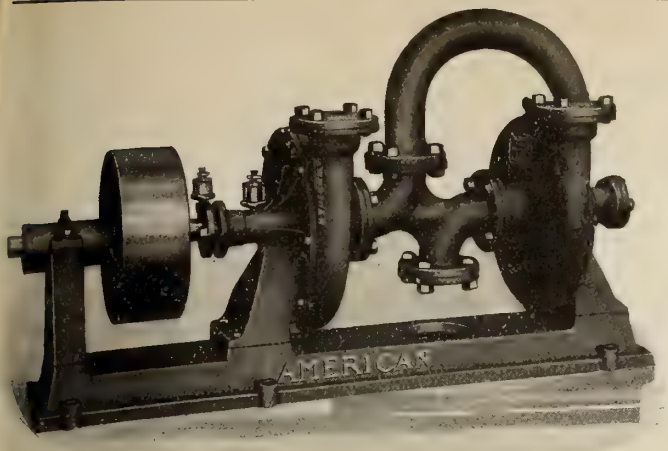


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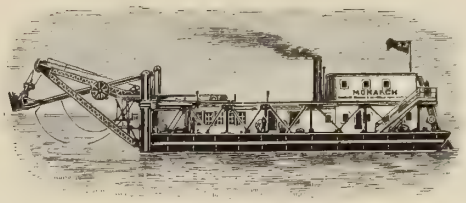
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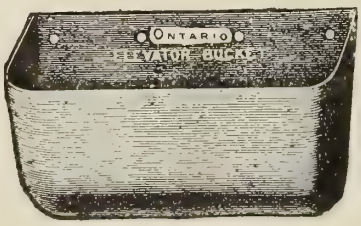
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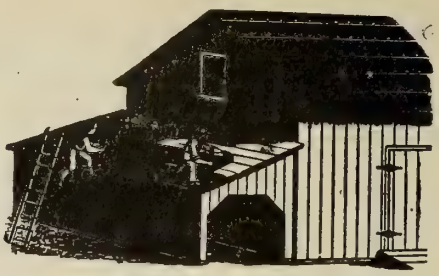
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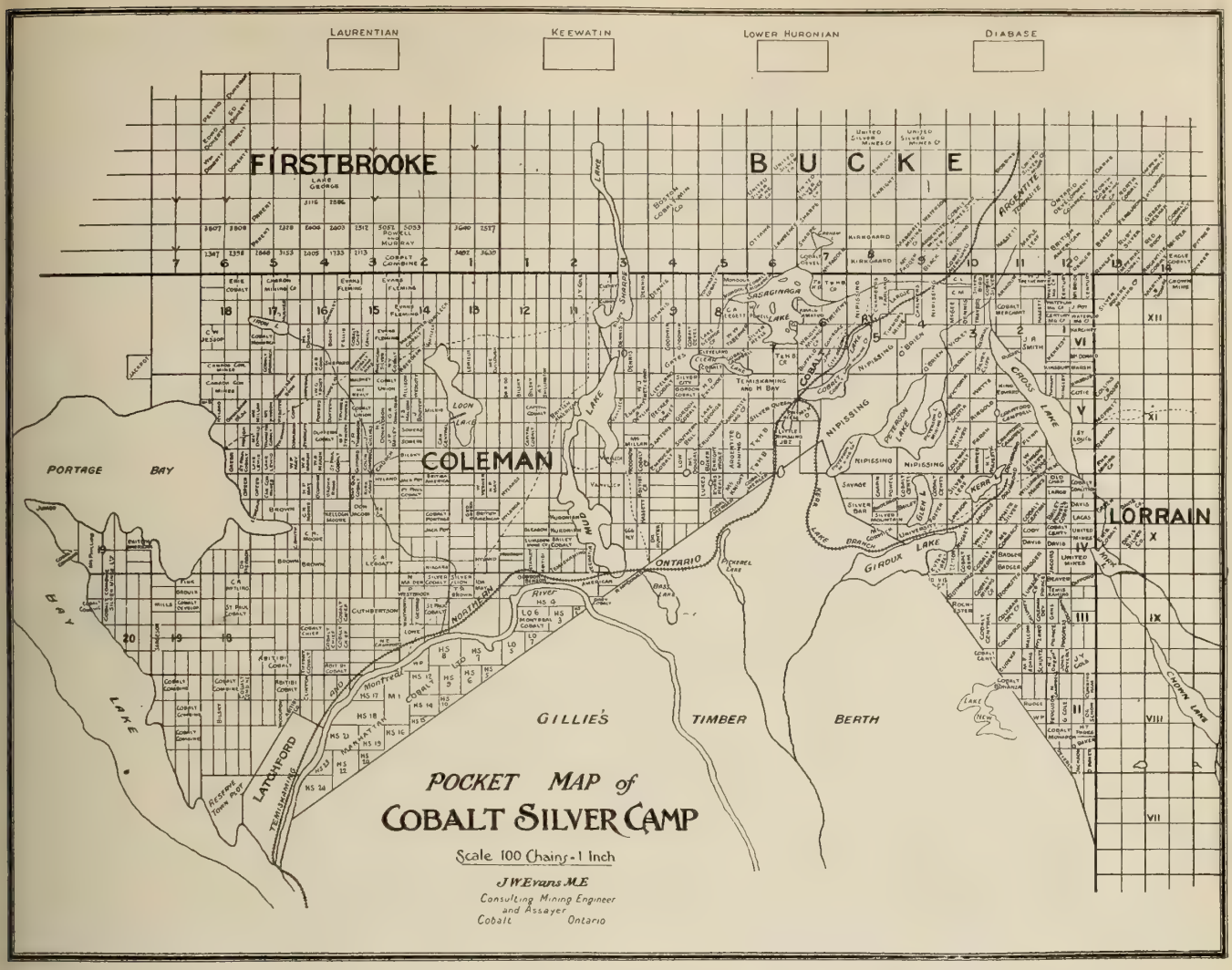
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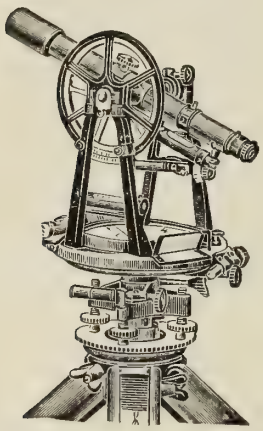
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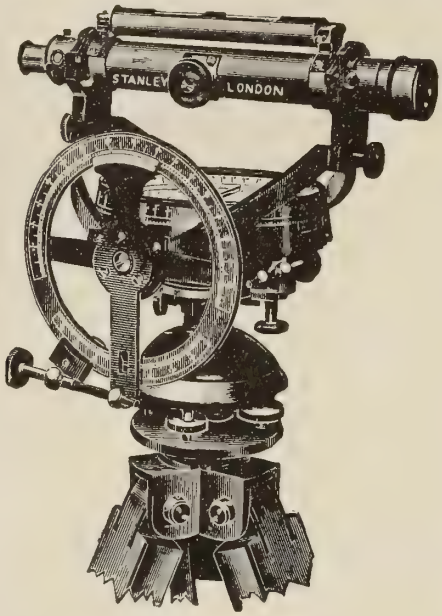
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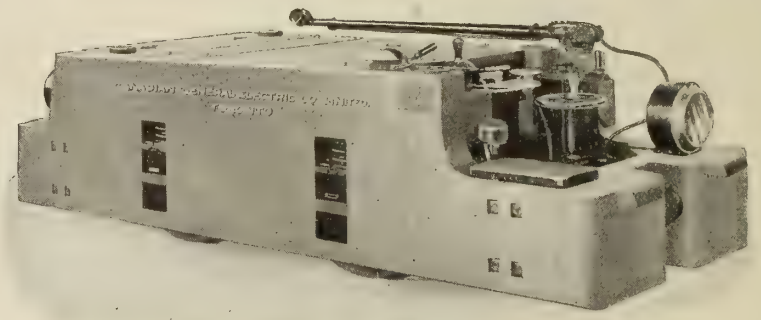
A number of First Year Entrance Exhibitions in Arts, ranging from $100 to $300 in value, are offered for competition in June, and a number of Second Year Entrance Exhibitions, and Third Year Scholarships, tenable for two years, will be offered for competition in September.

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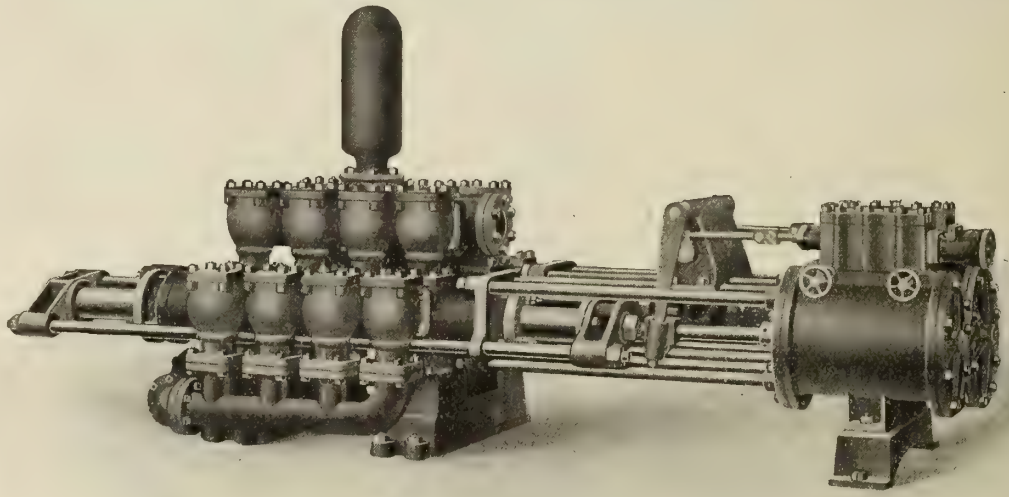
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THE CANADIAN MINING JOURNAL

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J. C. MURRAY, B.A., B.Sc.

Associate Editor, H. MORTIMER-LAMB, Secy. C.M. Inst.

Business Manager - - - J. J. HARPELL, B.A.

Circulation Manager - - A. P. DONNELLY, B.A.

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicolet, School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M. E., Nelson, B. C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron & Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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COBALT LAKE

The Cobalt Lake Mining Company, whose property is described in this issue, is confronted with an engineering problem which is neither so complex nor so hopeless as is generally supposed. The ore lying under the lake bottom is to be won. Shafts are being sunk within a few feet of the east shore of the lake, and when these have attained a suitable depth, drifts will be started from them under the lake. Contrary to the expectations of many critics, no difficulty has been experienced with water. The shafts make only a few gallons per day. Surface prospecting has been proceeded with, but more attention has been paid to shaft sinking, and we have no doubt that encouraging results will reward underground development. Briefly, if the Cobalt Lake Mining Company were capitalized at a reasonable figure there would be very little cause to hold anything but a very cheerful view of its prospects. Unfortunately, it was thought necessary, in organizing the company after the purchase of the lake, to set its capital at $5,000,000. Of the stock issued a large amount went in commissions and brokerage. Large blocks were assigned to certain persons for no apparent consideration whatever. Had the capitalization included merely the purchase price and the amount actually necessary to develope the mine, Cobalt Lake would have been a most desirable proposition. As it stands to-day it is problematical, though by no means hopeless. Fortunately, a vigorous and comprehensive policy has been adopted in developing the property. No shipments have been made, because it was frankly recognized that regular shipments cannot be counted upon until a relatively large amount of preparatory work has been performed. Any other policy would spell ruin.

So far as the peculiar difficulties of mining are concerned they have been carefully studied, and, we believe, successfully attacked. But considerable as these difficulties are, they do not handicap the enterprise to the same extent as does its egregious capitalization.

Incidentally, the Ontario Government has been criticized for its share in the original sale. No doubt the Government has erred on several occasions in affairs pertaining to Cobalt. Under the circumstances it is surprising that more mistakes were not made. But we consider the Government perfectly justifiable in this transaction. It advertised Cobalt Lake as for sale to the highest bidder. To the highest bidder, complying with necessary conditions, Cobalt Lake was sold. The purchase price was not excessive, when the tremendous contemporaneous inflation of values is considered. Nor would the first cost of the property militate against its successful working had not subsequent manipulation

raised the capitalization far beyond the safe or necessary limit.

If Cobalt Lake succeeds, it will succeed in spite of the unwisdom of its promoters. If it fails the blame cannot be laid upon the Provincial Government, nor upon its sane and efficient executive.

DISSIPATION OF ENERGY

Although in the ordinary iron blast furnace we have one of the most economical forms of the utilization of the energy stored up in coal, still even in its operation there are many very serious losses of energy. No scheme has yet been devised whereby the heat contained in the molten slag can be utilized. Sporadic attempts have been made to this end, but no method has been evolved whose application is of general value. Similarly in the quenching of the pig iron after it has been moulded, a considerable loss of heat energy occurs. But in the production of coke for use in the furnace the loss of energy is most marked. In the case of bee hive ovens the whole of the volatile hydrocarbons are entirely lost. The incandescent coke is quenched in the oven, and again energy is dissipated to the winds. With the by-product ovens, the most serious loss occurs in this quenching. The red hot coke is pushed out of the rectangular ovens and is quenched on a platform with a stream of water. In view of the efficiency of all the other operations of these ovens, this wasteful method is anomalous. It is surprising, indeed, that it has not been superseded long ago. That the utilization of this hitherto wasted heat energy is practicable is demonstrated by Mr. Charles E. Arnold in an article on "Quenching of Coke," in the May number of *The Chemical Engineer.*

In principle his plan is simplicity itself: "The hot coke is pushed from the oven directly into the cooling apparatus, which communicates directly with any oven which is ready to be 'pushed.' The coke having been received into the compartment, the doors are closed and the outside air entirely excluded. The small amount of air in the compartment is soon deoxygenized, and the hot gases (nitrogen, carbon monoxide and carbon dioxide) are drawn away from the coke, blown through a cooling compartment and again in contact with the coke. This circulation is kept up for a short time, when the coke can be discharged into the air without danger of combustion.

"The heat from the coke has been carried by inert gases to the iron coil, which conduct it to the water or other cooling medium circulating within said coils, thus making every unit of heat given up by the coke available for regeneration for a multitude of purposes." The still unremedied leakages of energy might very profitably become subjects of attention from the various Technical Colleges.

PROPHETS WITHOUT HONOR

The conferring of honorary degrees is a pleasant and profitable function. It is expected of our larger universities that they will see to it that those on whom they bestow recognition shall not only be in themselves worthy and distinguished men, but that they shall have been directly or indirectly of signal service to the community or to the country at large. Thus it is appropriate that the professional man whose work, whether literary or scientific, or specifically technical, has actually benefited his fellows or has ameliorated the hardships incidental to any class or classes of society or, in fine, has tended in any way to improve the conditions of life, should receive official recognition from the universities. But our universities are educational institutions supptored by the people, for the people. Doubtless the larger foundations serve a dignified and useful purpose in conserving the ideals and maintaining the best traditions of the Canadian people. But their first duty is to fit our young men to earn a livelihood and to recognize and encourage men, Canadians primarily, who are doing and have done something to advance the material welfare of their native land. In glancing over the names of those upon whom in late years the University of Toronto has conferred honorary degrees, we find men of letters, politicians, doctors and lawyers. Many of these are distinguished foreigners, whose relation to Ontario's welfare it is hard to guess. We do not question their worthiness. But we wish to suggest, not without humility, that the Province of Ontario and, indeed, the Dominion of Canada, owes far more to the geologist, to the mining engineer, to the civil engineer, and to the technical man generally, than to any of the classes that Ontario's largest University has chosen to honor. We would further suggest that the University of Toronto need not look far afield to find creditable recipients for the honors of which she has the bestowal. The world is moving.

LABOUR

It would be well for the Federal authorities to take prompt measures to relieve the dearth of labor in the West. In British Columbia and the new Provinces the the production of coal could be greatly increased were there a sufficiency of labor. The operators of metalliferous mines in British Columbia have been forced to grant substantial increases of wages to their employes to prevent them from leaving for other parts. These distressing conditions will, in the case of the coal mines contribute towards another fuel famine next winter Metalliferous mining in British Columbia is but now recovering from a long period of depression. It is essential that these industries be watched and guarded. The Federal Government employs emigration agents in Europe, and it has ample sources of information. The streams of immigration are, to a certain extent, dirigible

It should be quite feasible not only to select the proper class of workers across the ocean, but to place them exactly where they are needed.

THE PAYNE MINE

The once famous Payne Mine was sold at public auction in Montreal to Senator Forget for $60,000. The bidding started at $800. In its time the Payne paid over $1,000,000 in dividends. The property consists of four small claims on Payne Mountain on the slope toward Carpenter Creek. The Payne was stupidly and grossly mismanaged. It is safe to predict that in due course it will once more become a producer.

The original company was organized in 1891, and was capitalized at $2,500,00 in $1 shares. From 1899 the shares fell steadily until a few years later they dropped to 10 cents. They then disappeared from the market.

PROGRESS

The large amount of mining machinery under order or being installed in the Cobalt camp is an encouraging symptom. In itself it is indicative of progress and may be taken as tangible evidence that the mine owners in general have faith in their properties. The needs of the camp have created a temporary famine in ore mining machinery. Air compressors and other machinery ordered six months ago from the manufacturers are still undelivered. These delays are especially costly to mines groaning under heavy share capital. Every effort is being put forth to catch up with the unexpected volume of business. It is quite apparent, however, that the manufacturers have been caught unprepared.

EDITORIAL NOTES

The new mining law in Germany has passed its third reading and been referred to the Upper House. The most important provision reserves the right of exploration in certain areas to the State, with the power to transfer the working rights to others against indemnity and with a temporary title.

Of recent years (one might almost say of recent months) gas producers and gas engines have been improved so markedly and their application widened to such an extent, that the cost of power has been cut in two. Peat and lignite are now possible and profitable sources of commercialy saleable energy. A peat bog may now become a rival of Niagara. There is already a growing tendency to develop power at the coal mines and transmit it electrically. The effects of this movement wil be entirely beneficial. The enormous waste, which is the usual concomitant of the usual methods of raising steam, will be obviated and a much higher efficiency in developing power will indirectly conserve our coal resources.

In our respected contemporary, *The Mining and Scientific Press*, there appeared recently an article entitled "On Technical Writing." Many of the pet phrases current among mining men were heartlessly impaled as specimens of "bad" English or as inaccuracies. While we concur entirely with the spirit of the article referred to, we may be allowed to remark that in another respect the composition of many technical men is faulty. To ourselves the laws of punctuation have always appeared to be a blot upon our civilization. The writer who seeks to punctuate by rules need have no other ambition in life. However, the remedy is at hand. A Toronto writer, Dr. J. D. Logan, in a quietly revolutionary little book, "Quantitative Punctuation," has breathed upon the hitherto sacred "laws" and they are not. We seriously recommend "Quantitative Punctuation" to all young technical writers.

It is now generally admitted by the best authorities that the spontaneous ignition of coal is attributable to the action of the occuded oxygen in the coal. Freshly-mined coal absorbs oxygen freely. Since the coal in some degree retains is original porous structure, these pores are filled with methane and carbon dioxide, gases associated with its origin. Freshly-mined coal, on exposure to the atmosphere gives up these gases and absorbs oxygen. In large pieces of coal this action is superficial; but it is tremendously increased as new surfaces are exposed by breakage. This phenomenon in itself can not bring about ignition. There must be at some point an extrinsic factor which causes a local rise in temperature.

Moisture is a very potent factor in promoting the chemical action of the occluded oxygen. Iron sulphide, despite the popular idea that it is the principal agent in causing spontaneous ignition, plays but a subsidiary part

We referred in a previous issue to the mischief wrought by unqualified or spurious assayers. A mining boom always brings with it a swarm of pseudo-assayers, imitation mining engineers and professional crooks. Cobalt has been afflicted with all three varieties. But as she takes her place as a steadily productive camp, she will give a more and more attentive ear to the reputable, honorable men of experience. To-day the better and cleaner element is in the ascendency. When Cobalt has attained her majority she will look with disgust upon the frisky fakirs of to-day, and a full page advertisement will cause her pain.

British Columbia Copper Company's Mother Lode Mine, Boundary District of British Columbia.

By E. Jacobs.*

Copper mining in British Columbia has steadily advanced in importance during recent years, and this to such an extent that the value of the copper produced was considerably in excess of that of any other mineral included in the Province's total production of nearly $25,000,000. While not the largest producer in the Province, the British Columbia Copper Company ranks second only to the Granby Consolidated Mining, Smelting and Power Company as regards total production of copper to date. It is therefore fairly entitled to rank as representative of the copper mining industry of the Canadian West, hence the choice of its largest mine—the Mother Lode—as the subject for an article illustrative of that industry.

Before giving information concerning the Mother Lode mine a digression will be made for the purpose of showing the relative positions of British Columbia generally and the Boundary district of that Province particularly as producers of copper in comparison with that of all the remaining parts of the Dominion combined. Incidentally, the proportion of copper in last year's total mineral production in Canada will be shown as under:

Important Position Occupied by Copper.

Next to gold among the metallic minerals produced in Canada is copper, the production of which in 1906 was, according to the preliminary estimate of mineral production made public last March by the Mines Section of the Geological Survey of Canada, in value more than one-fourth of the total of metalliferous minerals produced, and more than one-eighth of the total mineral production—metallic and non-metallic—of the Dominion for the year. The respective totals were given as under:

	Value, 1906.
Copper	$10,994,095
All metallic minerals	42,979,629
Total mineral production	80,000,048

Ten years ago the position stood thus:

	Value, 1896.
Copper	$ 1,021,960
All metallic minerals	8,030,633
Total mineral production	22,474,256



MOTHER LODE HILL IN FALL OF 1896.

These figures show that the production of copper has increased in much greater proportion than other minerals, in what ratio is easily calculated from the foregoing figures.

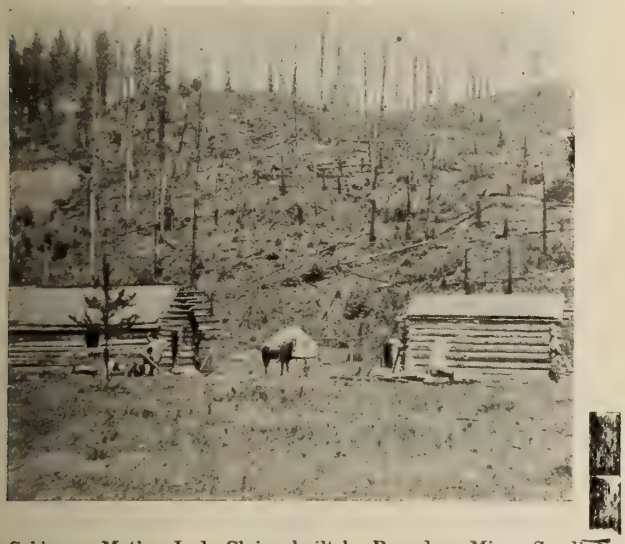
Another comparison shows that by far the greater part of the increase in the production of copper has been made in the Province of British Columbia. The figures for that Province and the remainder of the Dominion, respectively, are as follows:

Production of	Value in 1896.	(1906. (Unrevised.)
British Columbia	$ 190,926	$ 8,675,100
Remainder of Dominion	831,034	2,318,995
Total	$1,021,960	$10,994,095

These figures indicate most unmistakably that, in regard to the production of copper, British Columbia occupies a place of pride in the Dominion.

*Editor *British Columbia Mining Record.*

Prior to 1894 there was no copper produced in British Columbia, or if there was the quantity was so small as not to have found place in the official records of mineral production. A comencement was made in 1894, when copper to the value of $16,234 was produced, partly by Nelson and partly by Rossland mines. Thereafter these mines continued to be the only producers of copper in the Province until, in 1900, mines in the Boundary section of Yale district commenced producing and quickly became important producers. By this time Nelson's production had decreased considerably. The



First Cabins on Mother Lode Claim, built by Boundary Mines Syndicat in 1896.

leading position since taken by Boundary copper mines over those of other copper-producing sections of the Province is exemplified in the following table, showing the total production of copper ore in British Columbia in all years to 1906, inclusive:

District.	Lb. of Copper.
Nelson	12,300,00
Rossland	63,825,000
Boundary	135,500,000
Coast	30,000,000
Other parts of Province	1,790,000
Total	243,415,000

During seven years (to end of 1906) Boundary mines produced 4,609 tons of ores, practically all of it copper ore of a low grade. The proportions of this total contributed by the several mines of the four copper mining companies operating in the district are as under:

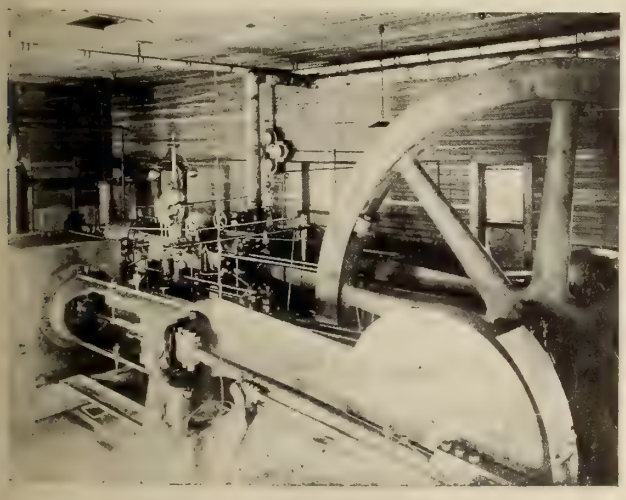
Company.	Tons.
Granby	3,005,000
British Columbia Copper	1,073,000
Dominion	390,000
Consolidated M. & S. of Canada	102,000

The remainder of the production of this district was chiefly from small silver-gold mines.

The British Columbia Copper Company, Limited, with head office in New York City, is working six mines in the Boundary district, four of which are in British Columbia and two in the adjoining State of Washington, just south of the international boundary line. Of these the Mother Lode is the largest. It is typical of the big copper mines of the district and, though not so extensive as the combined mines of the Granby Consolidated Company in Phoenix camp, distant about seven miles from the Mother Lode, is a decidedly important and valuable mine, having a producing capacity, as now opened and equipped, of about 1,000 tons of ore per diem, and with further development in progress in preparation for a still larger output

The Mother Lode is situated in Deadwood camp, about three miles west of the Town of Greenwood. The mineral was located on May 28th, 1891. The surrounding hills were but thinly timbered, and the big copper-stained bluff or "blowout," then a prominent feature, could be seen from such a distance that the prospectors had no difficulty in finding "mineral in place" to warrant their making the location. The accompanying view of the Mother Lode hill, reproduced from a photograph taken by Mr. Keffer in 1896, gives a fair idea of the surface appearance the claim presented shortly after the work of prospecting the big showing of mineralized rock occurring on it had been fairly commenced.

Prior to 1896 there had been no work done on the Mother Lode other than the very limited amount necessary to fulfil the annual assessment requirements. In that year the claim was bonded by Col. John Weir, representing himself and Messrs. F. L. Underwood and Jas. F. Tichenor, all of New York City. Mr. Frederic Keffer, now president of the Canadian Mining Institute, was placed in charge of the property immediately after the bond was obtained and thereafter he developed it for the Boundary Mines Syndicate, formed by the three gentlemen first above named. When Mr. Keffer commenced work there was not a tunnel nor a shaft 25



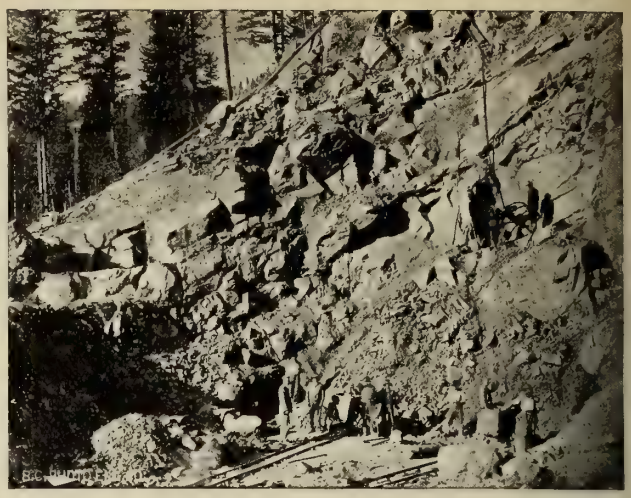
40-Drill Air Compressor. Installed in 1902.



Canadian Rand Hoisting Engine. Installed in 1902.

feet in length or depth on the claim; to-day he is still in charge and during the intervening periods of between ten and eleven years there has been done under his direction development work that in sinking and raising, drifting and cross-cuting, has aggregated fully 21,000 lineal feet (about four miles), leaving out of account much other work done in underground stoping and surface quarrying in the big ore bodies opened up here.

In March, 1897, prospecting operations having meanwhile proved the occurrence on the Mother Lode and adjoining mineral claims of unusually large bodies of ore, the British Columbia Copper Company, Limited, was organized in New York, to acquire and work the Mother Lode group, consisting of the Mother Lode and five adjoining fractional claims previously purchased, the whole giving an area of about 80 acres. A power plant was installed and the systematic development of the mine undertaken. The plant consisted of two 60 horse-power steam boilers, 10-drill Ingersoll-Sergeant air compressor with complement of drills, station sinking pumps, Ligderwood hoisting engine with 30 inch drum, and all else requisite to make a complete plant. The weight of this machinery, etc., was about 85 tons, and it was no light undertaking to haul it in wagons from the railway at Marcus, Washington (at that time the nearest railway station), to the mine, a distance by road of 65 miles. A two-compartment shaft was sunk and levels opened at 200 and 300 feet depth.



Open Quarry as it appeared in 1902.

Three years later it became necessary to provide a much larger power plant, so an air compressor having a capacity of 30 to 40 machine drills, and supplied with steam from two 100 horse-power boilers; a Canadian Rand double cylinder hoisting engine, with cylinders 22 x 42 inches and drums of 6 feet diameter, with two 80 horse-power boilers to furnish steam for operating; two large rock crushers, and much other machinery, were installed. Ore bins having a holding capacity of about 3,000 tons were erected, and bunk and boarding house accommodation was provided for more than 100 men, beside cottages for married employes. Recently electricity was substituted for steam to drive the heavier machinery.



GENERAL VIEW OF MOTHER LODE MINE IN 1902.



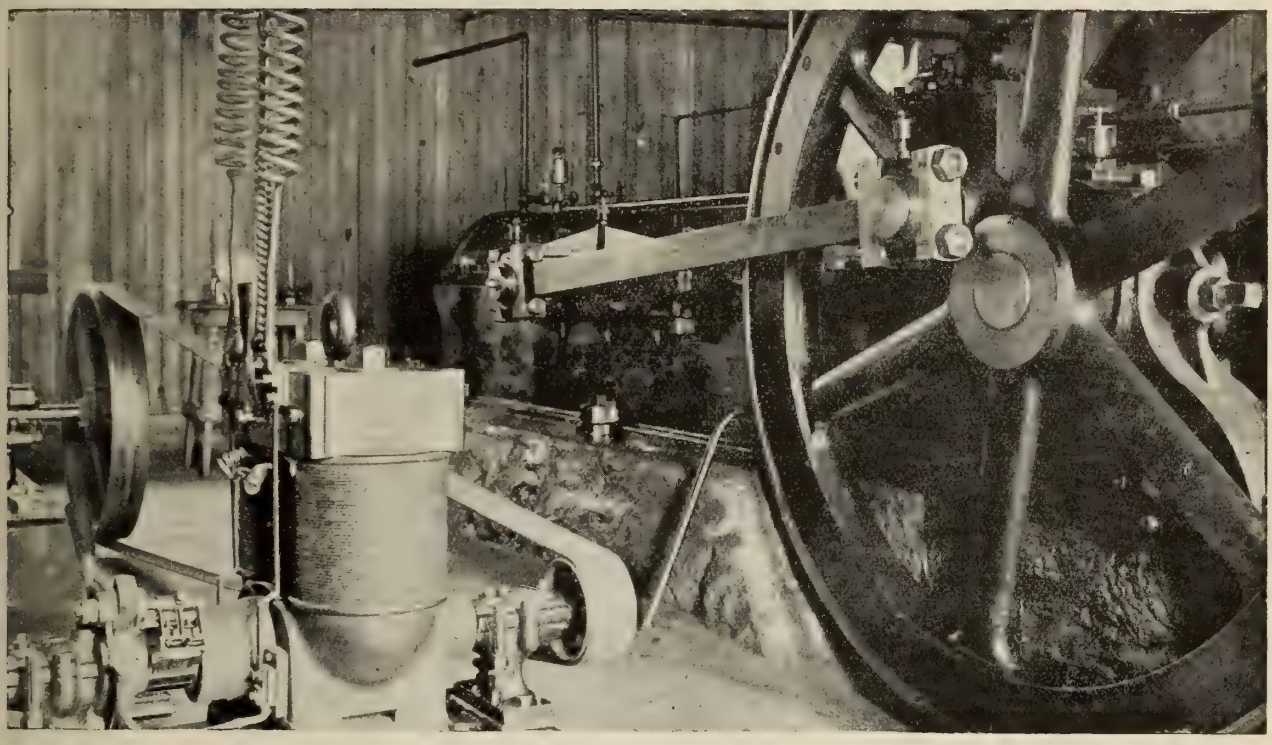
Open Quarry as it appeared in 1902.

The several different methods followed in working the mine, after the company had erected smelting works and it became necessary to regularly maintain a comparatively large output of ore, were dealt with in two papers contributed by Mr. Keffer to the "Journal of the Canadian Mining Institute" in 1902 (p. 213, and 1904, p. 42), respectively. One plan, known as the "pillar and stope" method, which continues to be of interest to mining men, was thus described by Mr. Keffer:

"The ore body was divided into stopes 30 to 40 feet wide, the length of the stope being the distance across the ore body. The cross-cuts already existing were used, and others cut where needed under the centre of each stope. From these cross-cuts upraises were made 30 feet apart. These were made 10 to 12 feet high, and were then connected by second and parallel cross-cuts. From these latter the stopes were opened out the intended width, and then carried vertically upward, the short upraises being cribbed and fitted with gates for loading. Between the stopes, pillars 20 to 25 feet in thickness

were left, these being frequently pierced to allow intercommunication and ventilation." The accompanying plan and section illustrate the general arrangement of the workings.

Afterwards the quarrying system, briefly noted by Mr. Keffer in his first paper, was so greatly extended as to admit of the hoisting of ore from the underground workings of the mine being discontinued for two or three years. Last year, however, in preparation for the considerably larger output that would be required to provide for the much-increased treatment capacity of the company's smelting works consequent upon the installation of three 600 to 700 ton blast furnaces, underground development was resumed in the mine. The main shaft was enlarged to a four-compartment shaft and deepened to 475 feet; a level was opened at 400 feet depth, and a second connection between the 300 and 400 foot levels was made by means of a winze. Much exploratory work was done by diamond drill with gratifying results, new drift, and its width as much as 200 feet. The foot wall is for the most part limestone, and the wall an altered diabasic rock. Sometimes there is a sharp demarcation between thelode and its walls, but in other instances the boundary is obscure. The ores themselves (so far as found) may be classed into three general groups: (1) A calcite carrying copper pyrites and iron pyrites, these sulphides sometimes being massive and sometimes scattered in small crystals throughout the rock. Some quartzite is also often present; (2) a silicate of lime, iron, magnesia and alumina, carrying both copper and iron pyrites, massive or scattered, and often also carrying quartz, or garnets, or serpentine, or often all three. Now and then a small amount of zinc blende occurs in this class of ore. (3) An excessively hard magnetic oxide of iron, with silica and copper pyrites; not often much iron pyrites. All these carry gold, and the calcitic and silicious varieties also carry small amounts of silver, about 1 or 2 ounces."



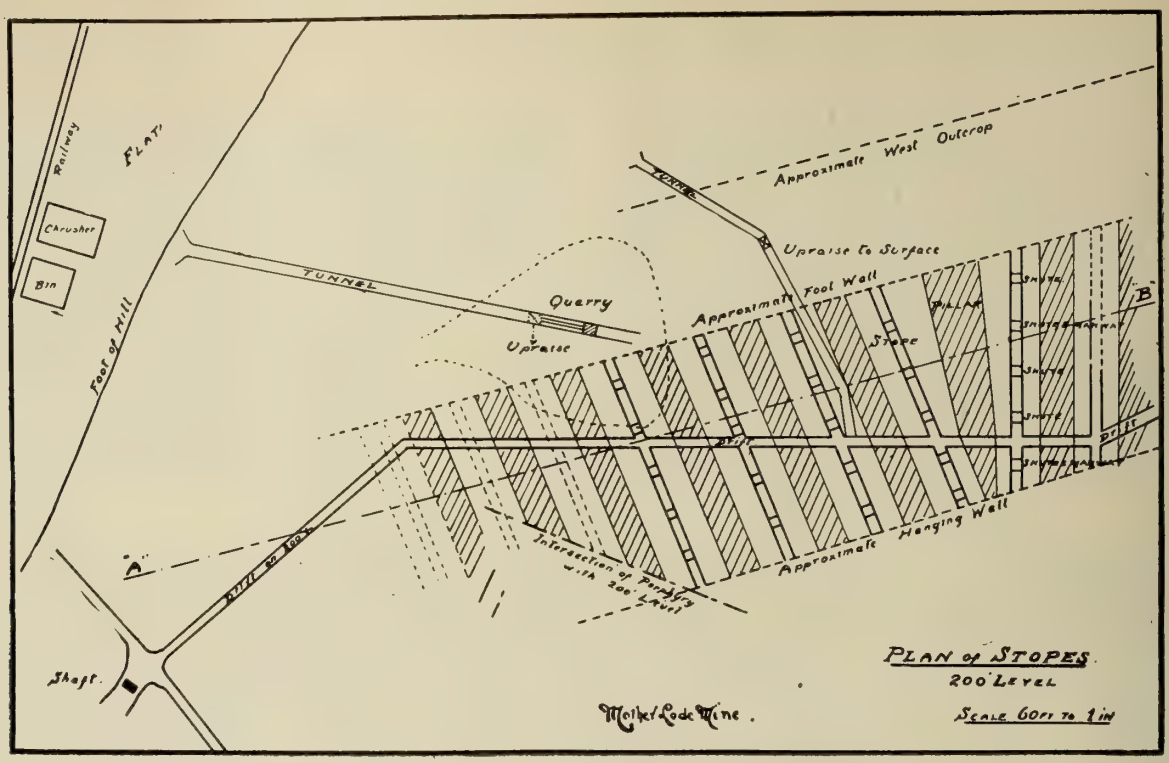
TEN-DRILL AIR COMPRESSOR. INSTALLED IN 1898.

bodies of ore of a shipping grade having been located. Beside preparing for stoping ore on all three levels—200, 300 and 400 feet—much work was done on an intermediate level opened at about 100 feet below the surface in a big body of sulphide ore. As a result of these developments underground, and of further additions to plant and machinery, the daily shipping capacity of the mine has been increased to about 1,000 tons of ore, crushed to a size suitable for charging into the blast furnaces at the smelter without further preparation.

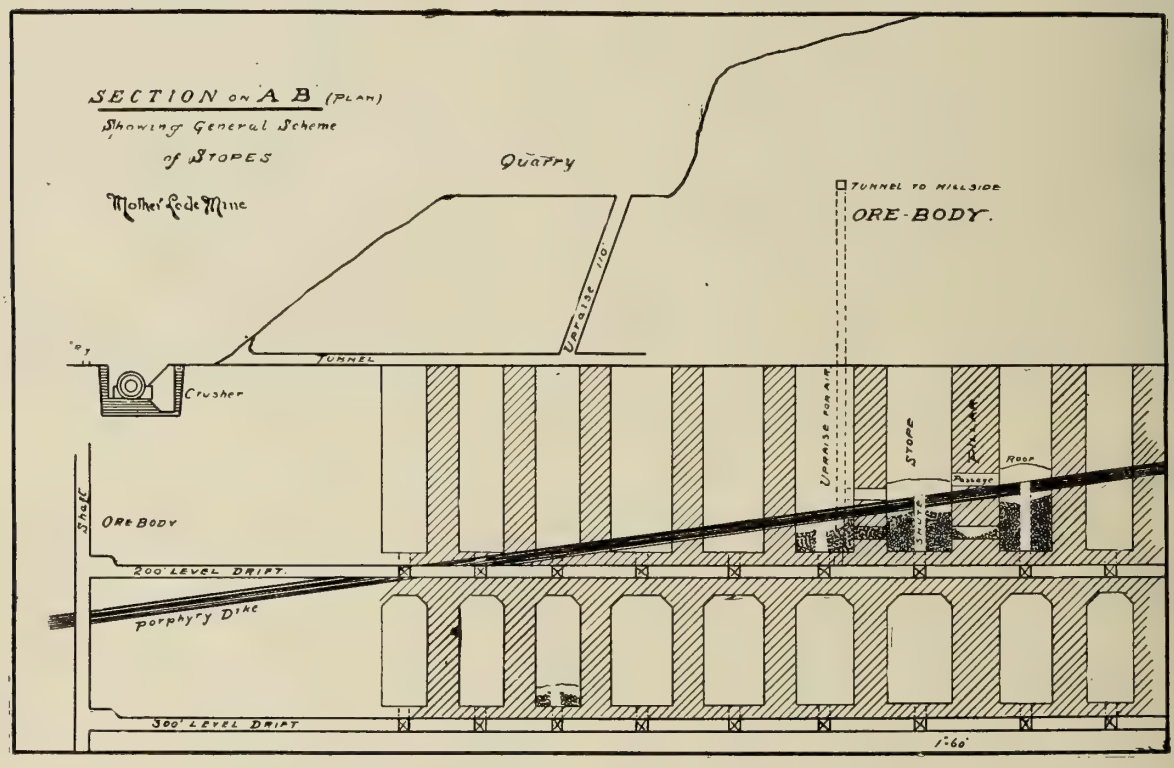
Concerning the character and extent of the Mother Lode ore bodies, Mr. Keffer, in his first above mentioned paper, said: "The croppings are in places soft oxides of iron from decomposition of ore-bearing rock, and in others unaltered magnetic iron oxides very solid and compact, carrying copper pyrites, iron pyrites, more or less quartzose material, and also carrying gold. The extent of the lode is surprisingly great, its length being some 1,100 feet to where it disappears under the heavy

After two or three years' experience of these ores had demonstrated their smelting characteristics, Mr. Keffer wrote:

"From a smelting standpoint, the ores of the larger Boundary properties have, as a rule, grown less basic as the workings have been extended and deepened. That is to say, the proportion of iron oxide ores to the whole ore body has sensibly diminished, there being no great change in the amount of other base. Whether or not this reduced proportion of base to acid ore is to be permanent, it is (at any rate in the case of the Mother Lode mine) impossible to predict. Long experience in mining these deposits has shown that it is not possible to make safe predictions as to occurrence of zones of mineralization, new ore bodies frequently having been found in unexpected places. On the 200 foot level of this mine there has been found considerably less oxide of iron ore than in either the quarries or the 300 foot level. The iron oxides of this latter level are uniformly of higher



PLAN OF STOPES, MOTHER LODE MINE, 1902.



SECTION OF STOPES, MOTHER LODE MINE, 1902.

grade than those of the quarries carrying more copper and gold, and they do not appear to be directly connected with the upper deposits, although this is not absolutely proven . . .

"The change in the basic character of the ore is illustrated by the following average slag analyses, taken over corresponding periods of 1901, 1902 and 1903. The small tonnage of foreign ores treated affects the assays somewhat, but not materially:

Year.	Silica.	Per cent. Iron.	Lime.	Total.
1901	33.2	28.5	20.6	82.3
1902	40.5	22.2	20.2	82 0
1903	42.7	20.4	20.2	83.3



GENERAL VIEW OF MOTHER LODE MINE IN 1907.

"With slags runnings in silica from 40 to 43 per cent. and matte at 40 to 45 per cent. copper, it is found that the furnaces can be maintained in good running condition, and slag losses kept within proper limits. To guard against possible scarcity of iron fluxes it has, therefore, become the general practice to conserve the iron ores of the mines, using only sufficient to keep slags within bounds above indicated."

The Geology and Ore Deposits of Franklin Camp, B.C.

By R. W. Brock, Ottawa, Ont.

(Toronto Meeting, 1907.)

The steady increase in the mineral production of British Columbia, which, last year, is estimated to have exceeded $26,000,000, the dividends now being paid. not by one concern, but by a considerable percentage of the operating mines, the continued increase in the demand for copper and the corresponding great advance in its price, the opening up of new territory by railway construction, the general prosperity throughout the commercial world, have all contributed to a revival of outside interest in mining in this Province, and to restore that confidence which, since the collapse of the '97 boom had been withdrawn. This renewal of interest will find expression in the reopening of properties now lying dormant in the older districts and in the birth of new camps. Portents of this are not lacking. One of the first districts to benefit by this improvement in conditions is what may be termed the hinterland of Grand Forks.

The Town of Grand Forks is situated in Yale district, at the Forks of the Kettle River, the eastern entrance into the Boundary Creek District. Its chief industry is the large smelting works of the Granby Company, which treats all the ores from their Phoenix mines, located on the mountains a few miles to the west of the town.

A short distance up the north fork of Kettle are several small mineralized areas that were partially developed some years ago, but which have been neglected the last few years. Farther up stream, on the east branch of the north fork, forty-three miles from Grand Forks, is Franklin Camp. It was located by Franklin MacFarlane, for many years a trapper on this stream. His discoveries and those of some friends attracted prospectors, and in 1900 a little colony of them were busy in this camp. During the same summer a reconnaissance survey, which included Franklin Camp, was made on behalf of the Geological Survey by the writer and Mr. W. W. Leach. The results of this survey were embodied in the West Kootenay map sheets, published by the Department.

But the camp had come into notice too late to be benefited by the boom. Moreover, it was three days' journey by pack train from Grand Forks; there was no immediate prospect of transportation facilities, and none was prepared under these conditions to buy surface showings at boom prices. During the last two seasons, however, some attention has been paid to the district north of Grand Forks. Last summer a wagon road was constructed to the camp, bringing it within eight hours' stage journey from the railway, and work was begun on a branch railway from Grand Forks up the North Fork to Franklin. Several townsites had been platted, and hotel and store accommodation provided.

Some of the salient points in the geology and tography are shown on the map, taken from the West Kootenay sheet of the Geological Survey. Many of the geological boundaries represented are only approximate, as when the reconnaissance was made the country was to a large extent timbered. Since that time the district has been burnt over and the rocks and ledges are now much better exposed; but as my visit last summer was restricted to one day, nothing could be done toward revising the

boundaries. The present paper is based largely on observations made during the reconnaissance.

The geology of the camp is somewhat complicated. The oldest recognized rocks are sedimentary, often greatly metamorphosed. Among these the most conspicuous, when not too highly altered, is limestone. It is metamorphosed to crystalline limestone and lime silicate hornfelds. The latter is sometimes a green and sometimes a compact, broken-up, light-colored, porcelain-like material, resembling a baked argillite. When alteration to silicates has been uneven and incomplete, a breccia-like or conglomerate-like rock results, with the green silicates sometimes as the matrix, with limestone rests and sometimes as the nodules, with an unaltered limestone matrix. The limestone and its alteration products occupy a larger area than represented by the limestone coloring on the map. Some argillites occur in this series, and closely associated are some greenstones. Large masses of gray Nelson granodiorite is intrusive in these basal rocks. Both these formations are intruded by small masses of a gabbro-like rock and a porphyritic syenite distinguished by its long reddish feldspar crystals. Towards the west, forming the West Branch divide, is a light acid granite (Valhalla Granite) intrusive in the above series, and to the east a pink, alkali-syenite, also later than and intrusive in the above formations. Numerous porphyry dykes from these intrusives traverse the older rocks.

At many points overlying the previous formations is a series of Tertiary rocks. These consist of quartzite-like, gritty tuffs with coarse conglomerate bands, conglomerates and ash beds, and overlying these again, lava flows with some inter-leaved ash rocks. The conglomerates hold pebbles and boulders of the older rocks, particularly of the granodiorite, limestone, greenstone and an older, finer-grained conglomerate These range in size from a half inch to two feet in diameter. The conglomerate appears to cover a greater area than represented on the map, reaching in places to the North Fork bottom. It is cut by dikes from the alkali syenite and from the volcanic rocks.

The lava beds, which occupy the higher levels, show in places basaltic jointing. Some beds are rich in gas pores, the latter often containing agate, calcite or zeolites. The intrusive rocks have profoundly altered the older formations over considerable areas, and incidentally ore deposits have been developed in the latter.

The deposits so far uncovered present several more or less distinct types.

1. Those in which the gangue consists of country rock altered to green lime-silicates, such as hornblende, epidote, garnet (generally reddish), with quartz and calcite. Such deposits, since they are especially apt to occur in the (altered) limestone may be, for convenience, called the limestone type.

Deposits of this class differ in the relative amounts of their metallic minerals, and, using this as a basis, may be sub-divided into—

(a) Pyritic Type—The metallic minerals consist predominantly of pyrite and chalcopyrite.

(b) Magnetitic Type—The metallic minerals consist predominantly of magnetite, with some copper and iron sulphides.

(c) Galena Type—The metallic minerals consist of galena, blende and chalcopyrite—this type occurs on the McKinley near type a and b; the silicate minerals are not prominent in the exposures on this lead, the crystalline limestone often abutting against the sulphides.

2. Chalcopyrite, or pyrite deposits with molybdenite, calcite and quartz in crushed zones, fractures, fissures or near contacts. Replacements or substitution of the minerals of the country rock by ore is usually conspicuous. Granodiorite or porphyritic syenite formed the country rock in all deposits of this type seen by the writer. For convenience, then, these may be referred to as the granite type.

3. Quartz veins, in which quartz is the dominant mineral accompanied by galena, blende, pyrite, chalcopyrite, molybdenite, arsenopyrite, etc.

The most extensively developed claim is the McKinley, on which approximately $30,000 has been expended in surface improvements, trenching, tunnelling and diamond drilling. On the north slope of McKinley Mountain in a band of crystalline limestone, running north across Franklin Creek to Franklin Mountain, four leads have been discovered. The strike of the leads has not been definitely determined, but they appear to be lying transversely to the direction of the limestone band—here about 300 feet wide. Along these leads the limestone is more or less changed to epidote, hornblende and garnet. The lowest lead, exposed by an open cut, shows a heavy development of magnetite, with some pyrite and chalcopyrite. The latter, while somewhat disseminated in small specks, show a tendency to accumulate in veinlets in the magnetite. Diamond drilling, which was in progress on this showing, was said to be demonstrating a fair sized body of ore.

The second ledge outcrops for a width of about 30 feet, but the dip is at a low angle southwest. It shows a heavy development of galena and blende as well as chalcopyrite. The lime silicates are only sparingly developed here, the crystalline limestone being often in direct contact with the galena. Only open cuts have been made in this lead. The grade of ore is stated to be high, particularly in silver. The third ledge, in which the chief work has been done, holds iron and copper pyrites, with a considerable amount of the gangue minerals. It is supposed to be about 40 feet wide, dips 45 degrees south, and has been traced for 300 feet.

The main working is a tunnel. About 100 feet in, a cross-cut has been run westward 104 feet, the last 80 feet of which is in ore. Two hundred and fourteen feet in the tunnel 15 feet of ore is encountered (No. 4 lead). This ore is like that of No. 3, except that it contains less pyrite and more chalcopyrite.

Average assays of the largest ledge are said to run about 2.5 per cent. copper and about $2.00 in gold and silver.

The McKinley Company are also testing the Banner claim on Franklin Mountain by diamond drilling. This claim has not been seen by the writer since 1900. At that time a strong, very wide lead of quartz, mineralized with galena blende and chalcopyrite were exposed.

On the Maple Leaf claim, on the northeast slope of Franklin Mountain, copper ore occurs in the reddish porphyrite syenite near and along its contact with the basal formation. The mineralization is confined almost exclusively to the intrusive rock. Fractures in this syenite are filled with seams of chalcopyrite and pyrite, or with green malachite resulting from the alteration of the copper ore by atmospheric weathering or surface water, and in addition there is marked selective replacement of the minerals of the syenite by the sulphides. The colored constituents are more readily replaced, so that where the action has not been excessive the prominent feldspar crystals may be found lying in a sulphide base. Where the replacement has been more extensive, the feldspars are attacked, and finally the whole mass of rock becomes sulphides. At several points along the contact, which is generally covered with wash, wide stretches of the more or less mineralized syenite have

been uncovered. About 400 fet back from the contact, an open cut has exposed a lode 4 feet wide of fairly well mineralized rock.

The Gloucester group, now being worked under bond by the Dominion Copper Company, was not visited. On the G. H. claim of this group is a ledge of magnetite, with a little pyrite and chalcopyrite. In places it is at least forty feet wide, and it has been traced several hundred feet. It seems to lie wholly in the grey granodiorite. On the Gloucester was a good showing of copper ore, with pyrite, molybdenite, calcite, and quartz, with grey granodiorite on one side at least, but the country rock is badly altered. Development here is made more difficult by some faults which have been encountered.

On the south slope of Tenderloin Mountain, several copper lodes were seen during the survey of the district. They occurred in the grey granodiorite, in fractures, or crushed zones. In the latter, the rock is sometimes crushed to a sort of nodular structure, the more highly triturated material of the rock wrapping round the ball-like rests of unbroken material. In these crushed zones, particularly along well-marked fracture planes, the mineralization by copper and iron sulphides is quite heavy.

In addition to the claims mentioned, a large number are held, on which deposits of one or more of the types mentioned, have been discovered. Most of the claims spoken of lie within an area 3 x 1 1-2 miles, and an area 8 miles long by 1 to 4 miles wide—covering both sides of the river, would embrace most of the discoveries so far made. There are possibilities, however, in this camp over a somewhat longer and a much broader area—all that ground lying within the encircling, recent acid or alkali eruption rocks, for all the older rocks of the camp, the altered basal rocks, the granodiorite, gabbro and porphyritic syenite are mineralized and lode-bearing. Lodes of the first type are likely to occur in the continuation of the limestone band northward from the McKinley, and in other limestone or altered limestone areas. Contacts seem promising points for prospecting, and in addition to the contacts, shear or crush zones in the massive rocks. From what has been seen of the acid granite, and the pink alkali syenite (Rossland alkali syenite) and the Tertiary lavas, both here and elsewhere in this Province, it is altogether unlikely that workable deposits, at all events of the described types, will be found in these rocks, but the older formations along their contacts, and along dykes from them is good ground to prospect.

In its geology and the nature of its ore deposits it bears a strong resemblance to the Boundary Creek district. The main rock formations are common to both, as are deposits of types 1a and b, and 3, the main difference being that in the Boundary sulphur is less plentiful, so that pyrrhotite is found in place of pyrite, and iron oxides are more prominent.

Deposits of Type 1 are connected with contact metamorphism by intrusive rocks—and are to be explained by the influence of heat, together with mineral-charged water or vapors given off by the cooling intrusive magma upon the country rocks. Such emanations ascend as best they are able by all sorts of channels, among which fissures and fracture planes are likely to be important. The rock along these channels usually exhibits characteristic alteration, produced by these mineralizers, and is often replaced by the mineral matter carried by them for some distance on either side of the channel—especially when complex fractures enable the solutions to wander into the rock and expose a great number of surfaces of attack. It will be evident that contact metamorphic action will not be confined to the immediate contact of the intrusive rock (indeed may be absent there) but may be irregularly distributed, according to the physical and chemical characters of the neighboring country rock, the distance below the surface, temperature and other precipitating conditions. There may be expected to be transitions between contact metamorphic deposits and ordinary lodes or veins, and such have been found in a number of places. Deposits of Type 2 are probably to be regarded as such—as are also the deposits of the Rossland Camp, now being mined. Deposits of the contact metamorphic type seem to be widespread in Southern British Columbia, not only in Boundary and Franklin, but in other districts as well, and will, no doubt, be recorded from a great many localities.

From descriptions of copper and magnetite deposits in the Similkameen, Kamloops and the coast, it would appear to the writer that examples occur in these localities. On the outskirts of the Rossland Camp the same type occurs, and transitional types to ordinary lodes and veins are widely distributed.

It has not been absolutely determined for Franklin Camp what intrusive rock has been responsible for the metamorphism and mineralization. The possibilities are the granodiorite, the alkali syenite, and the undiscovered or unrecognized plugs or dykes which gave vent to the lavas. The first is in closer proximity to the deposits in large exposed areas, but the second is well represented by large dykes; of the third, as no information is at hand, nothing may be said. The granodiorite is itself deformed and mineralized; the alkali syenite at certain points in this section is responsible for mineralization and seems to have been injected just prior to the great period of ore formation. Both these rocks are present in the districts of Southern British Columbia visited by the writer, which are characterized by this class of deposits. At present, the balance of the evidence seems to be rather in favor of the alkali syenite as the metamorphosing rock. In the Boundary district the large syenite porphyry dykes seem to have been furnished by the mineralizers. (1) In a recent monagraph (2) Lindgren ascribes the origin of the Clifton-Morenci contact deposits to porphyry dykes.

The contact metamorphic deposits, while distinguished by Von Goddick in 1879, have only in recent years been recognized as an important type, found in a large number of copper-gold districts, but an extensive literature on the subject is now being rapidly accumulated.(3)

Of the more important deposits of this class may be mentioned some of the Clifton-Morenci copper deposits, Arizona (4), the copper deposits of Cananea, Mexico (5), and the gold-copper deposits of many other parts of Mexico. In Eastern Ontario, the writer has recognized examples of this type.

Since limestone has been found to be the country rock of most of the contact metamorphic deposits hitherto described and consequently seems to be the rock most susceptible to this mode of alteration, and since in its impurities it contains many of the elements necessary to form with the lime the observed gangue minerals, the inference has been widely drawn that such deposits are peculiar to limestone contacts. This fact has been included in various definitions of this type of deposit. Many authorities (Rosenbusch, Barrell, Zirkel Klockmann) hold that the results are due to the alteration of impure limestones through heat alone, and that there has been no addition of material, by waters and vapors, at all events none to go towards the formation of the typical gangue minerals. Others, as Michel Levy, Vogt, Lindgren, Kemp and Blake, bring forward facts to show that some of the material of these minerals has been in-

troduced by emanations from the intrusive lava. In the Boundary Creek District the evidence is wholly in support of the latter view, (6) and the same seems to be true in Franklin Camp.

In many places the limestone is altered to marble, except in the mineral-bearing zones. These mineralized zones have not the accordance in strike, nor the regularity in distribution that impure bands in a limestone would possess. The ores must certainly have been introduced, and there is good reason for believing that the iron and silica of the silicates have been as well. Moreover, these deposits are not confined in these districts to limestone as a country rock.(7) In the Boundary Creek district the writer has shown that even the granodiorite is mineralized to some extent in this way, and that in it garnet zones are developed. A full description of this formation of garnet in granodiorite will be given in a paper shortly to be published. Kemp, in a recent paper (8), describes the formation of a similar mineral-bearing garnet zone in granite porphyry at White Knok, Idaho. In Franklin Camp, the magnetite ore of the Gloucester group, according to notes taken in 1900, occurs in the granodiorite, and some of the copper ores of the camp also have this as their country rock.

The development work already done in Franklin Camp is limited and shallow, so that it is not known how the values, particularly the copper values, will hold out in depth, nor is it yet demonstrated that a large tonnage of low grade ore can be maintained. To prove these points requires extensive development and time. While good values have been found on some of the lodes, it will probably be on low grade ore that the success of the Camp must depend. The results on the McKinley, so far, seem to be encouraging.

While nothing can yet be said of the extent and value of the mineralization, while it is yet too early to state that any one of the prospects is going to be a good mine, it may be said that the camp posesses many of the earmarks of a mineral-bearing district and that in kind, whether or not in degree, in the nature of its ores whether or not in extent, it takes its places in a goodly company of mining camps, among which its neighbor, the Boundary Creek district, is not the least important.

The expensive development work required in this camp will be greatly facilitated by the railway, and when this reaches the camp, its possibilities will no doubt be tested as they deserve to be.

(1) Preliminary Report on the Boundary Creek Mining Dist. Summary Report G. S. C., 1902, p. 90-136.

(2) Prof. Paper, 43, U. S. G. S.

(3) As examples the following may be cited. The Character and Genesis of Certain Contact Deposits. W. Lindgren. Genesis of Ore Deposits, A.I.M.E., p. 716, T.A.I.M.E., Vol. XXXI.

Copper Ores and Garnet in Association, W. P. Blake, T. A. I. M. E., XXXIV,, p. 886.

Limstone Granite Contact Deposits of Washington Camp, Arizona, W. O. Crosby, T. A. I. M. E., XXXVI, p. 626.

Ore Deposits at the Contacts of Igneous Rocks and Limestones, and their Significance as Regards the General Formation of Veins. J. F. Kemp, Economic Geologist, Vol. II, p. 1.

Die Kieslagerstatten Roros Sulitelma und Rammelsberg. J. H. L. Vogt, also Genesis of Ore Deposits, A. I. M. E., 1902, p. 648. Zeilschiep for Prak. Geologie, 1894, p. 177, 464, and 1895, p. 154.

(4) Lindgren, U. S. G. S., pp. 43; and T. A. I. M. E., Vol. XXXV, p. 511.

(5) Ore Deposits near Igneous Contacts, Weed, T. A. I. M. E., Vol. XXXII, p. 715.

(6) Preliminary Report on the Boundary Creek District, R. W. Brock, Summary Report, G. S. C., 1902, p. 90?136.

(7) Op. Cit., page 107, also Journal Can. Min. Inst., 1902, p. 369.

(8) Economic Geol., Vol. II, p. 1.

THE BRITISH IRON AND STEEL INSTITUTE.

PRESIDENTIAL ADDRESS.

By Sir Hugh Bell, Bart.

A little more than a hundred years ago, when the nineteenth century was still in its salad days, my grandfather, the son of a Cumberland yeoman, came to the Tyne to enter the service of a well-known firm of Newcastle merchants, into which he was shortly afterwards admitted as a partner. He was born in Cumberland, near Woodside, the seat of the Losh family, and no doubt Mr. Losh, the senior partner, was instrumental in bringing the young man to "The Quayside," a term which indicated the business quarter of the cannie town as clearly as "the City" does that of the English metropolis.

That I, the grandson, occupy by your kindness the distinguished position of your president, and, in that capacity, am called upon to deliver an address this morning, makes it not inappropriate that I should choose as my subject a review of the position of the great trade in which we are engaged as it was then and as it is today, a century after the occurrence which identified the fortunes of my family with the maunfacture of iron.

I am only too sensible that it is because of my parentage that the choice of the Council has fallen on me, and that it is as the son of Sir Lowthian Bell that I have been selected to follow a most distinguished series of men who have adorned the chair I now unworthily fill. This affords an additional reason why I should choose for the subject of my address a sketch of the iron trade in the last hundred years, for his life, begun in 1816 and ended nearly ninety years later, almost covers the period I propose to pass briefly in review; to do so exhaustively would mean a great and profoundly interesting volume.

Let me then ask you to recall the position of the world in 1807, when the young Thomas Bell entered the firm of Losh & Company, so that we may understand from what platform we started.

The eighteenth century had closed on a world under arms. The titanic struggle which we identify with the name of Napoleon was at its height, and the new century opened amidst the din of battle. The power of the Colossus who was attempting to overstride Europe was undimmed, and rumors of invasion of "the little isle set in the silver sea," which strove to withstand the overwhelming onslaught of his armies were everywhere current.

The men of that day might well contemplate the future with anxietv bordering on terror. But before the first decade had closed an event occurred which, to those who had eves to see, put a term to the dreams of universal dominion, which had dazzled the imagination of the great Corsican. In October, 1805, Trafalgar Bay had witnessed a sight which virtuallv ended the conflict, though nearly ten years elapsed before the war of the giants ended and Europe was left free to effect the great commercial development which, in one of its aspects, I propose to lay before you.

For while Europe was one vast battle-field, and men's

energies were being devoted to arms and their capital to armaments, the fertile brains of inventors were busy. Great discoveries were being made, or, what is more important for our purpose, were being turned to useful ends.

Two centuries earlier men had become aware that a great instrument stood ready for those who knew how to use it, but the common opinion which gives to James Watt (1736-1819) the credit of the steam engine, and forgets Giovanni Branca (1601), Solomon de Caus (1615), the Marquis of Worcester (1663), Denis Papin (1690), and even Thomas Savery (1698), is doing that rough substantial justice which the popular view rarely fails to distribute. Though the great Scotchman was unquestionably aware of the importance of his improvements, which, in fact, made steam the powerful agent we know, even he would be surprised could he see how far his successors have surpassed him in its economical use, and what purposes they have made it serve. For Watt died in 1819, when the steamboat was in its earliest infancy and steam traction on land was hardly begun.

The propulsion of ships by steam dates from the end of the eighteenth century, but John Fitch's invention brought him nothing but misery, and led to his suicide in 1798. The Iron and Steel Institute is of so cosmopolitan a character that it would be unseemly to assert for Great Britain claims which may be contested. I will, therefore, not seek to award the merit of the practical employment of steam in ships as between my namesake Henry Bell (1767-1830) and Robert Fulton (1765-1815), though I might claim the credit for "Britain" in either case, since the American was born at "Little Britain," in Pennsylvania, while Bell hailed from Torphichen Mill, in Great Britain. The two purposes to which I have referred give us the reason why the nineteenth century should have witnessed the great industrial developments, to a rapid sketch of which my address is devoted.

While men were dependent on such puny instruments as those which had served their purposes since civilization dawned on the world, we may rather be surprised at the wonderful ingenuity which enabled them to accomplish so much than at the the slow progress which had been made. I have within the last few months visited the Valley of the Nile and seen with amazement the great works accomplished by a people who, as far as we know, possessed no other contrivances than the lever, the wheel, and the inclined plane, and those primitive instruments which our remote ancestors devised when they emerged from the rest of the animal creation and stood forth as men. The magnificent monuments of that wonderful land bear comparison for stupendousness with the great works which the engineers of the nineteenth century have constructed for the benefit of the country and the world at large, while in beauty they vastly surpass them. But without such assistance as we can now call to our aid, it is impossible to conceive the industry of the world on its present scale conducted under the conditions which produced the marvels we admire in Egypt.

Now, of all the aids we have at our disposal to-day, none is more important than the facility of transport. It has been said that no real improvement in this respect was made from the time when the Romans began to build roads till steam took the place of vital power as a propelling force, and that the Emperors Caracalla and Geta, hurrying from York to claim the Imperial purple in the third century, were no longer in reaching Rome than was Sir Robert Peel in returning from Rome to London to become the Prime Minister of Great Britain in the nineteenth. Yet till the power of bringing together in great masses the mineral resources of the world was attained the output of iron was limited to those districts where the ore and the fuel chanced to lie in juxta-position. The great developments of recent times depend entirely on the improvements in transport. What would the founder of the ironworks at Dowlais have said had he been told that their prosperity would come to depend not so much on the fact that the iron ore and the coal could be extracted from the same pit as on the accessibility of Cardiff to the Basque Provinces of Spain? And the two things react on one another—without steam transport a highly developed iron trade is impossible; without abundant and cheap iron steam traction is inconceivable. It is for these reasons that the history of railways is so intimately connected with that of the iron trade.

As is well known, the idea of a fixed and rigid path along which the wheels of a wagon should travel is a very old one, but until the end of the eighteenth century it had been but little utilized. It remained for George Stephenson (1781-1848) to show tthat it was essential to the construction of a road on which the means of traction should be that new power which the genius of Watt and his collaborators had placed at man's disposal. Here, again, the common opinion which connects the name of Stephenson with this great invention and disregards, or at least places in subordinate positions, Murdock, or Trevithick, or Blenkinsopp, or Hedley, does no more than substantial justice. The first quarter of the nineteenth century witnessed the trials and failures which were to end in revolutionizing carriage by land. In 1822 the first railway, in the modern sense of the word, was opened for mineral traffic, while three years later (in September, 1825) the first passenger line, the forerunner of the vast network which now overspreads the civilized world, began operations between Darlington and Stockton.

But to render this possible much more was needed than to invent the locomotive engine or the fixed path. Here, again, we find many names claiming to be inscribed on the roll of fame as entitled to the honor of inventor of the process which was destined to bear its part in the coming revolution. To Henry Cort (1740-1800) we must, in any case, assign a prominent place on the roll, for though we may deny him the title of "father of the iron trade," or even that of the "inventor of puddling," there can be no question that to his ingenuity the industry owes a deep debt—a debt only indifferently discharged by grants from the Government of the day, the last of which was made, at the instance of Dr. Percy, one of my predecessors in the chair, by Lord Palmerston, to Cort's only surviving son, in 1856. If to him we add John Wilkinson (1728-1808), and the veritable dynasty of Abraham Darbys, of whom the grandfather was born in 1677 and the grandson died in 1791, we have noted the chief of those whose endeavors towards the improvement of processes connected with the iron trade rendered it possible for the inventors of the railroad to make the fixed path of malleable iron produced in great quantities and at reasonable cost. It is not unnatural that the bulk of the names mentioned have been citizens of Great Britain. This country, from its physical configuration, its geological peculiarities and its limited size, presented the most favorable laboratory in which to try experiments. To these circumstances is due the fact that, at the beginning of the last century, one-third of the world's production of pig iron came from these islands, though the total production of the world did not exceed three-quarters of a million tons.

In every case it will be found that the production of iron depended on the proximity of fuel and ore. The iron trade of Sussex died when the exhaustion of the forests removed the fuel. Staffordshire, Scotland, South Wales, indeed every ancient seat of the iron trade in Great Britain, tell the same story, which is true of Sweden, of Russia, and of every country whence, before we entered on the new phase, we drew supplies. For it is interesting to observe that, in the past, England was an importer rather than an exporter of iron. From Sweden, which in 1780 was the chief producer, and from Russia she brought the metal which her smiths were to fashion into those goods for which she was early to become renowned. But though Sheffield holds and has long held the highest reputation for the excellence of her wares, it is significant that from Spain we derive bilbo as a name for our sword, and from Syria the word damascening to describe the pattern with which it is adorned.

But neither Bilboa nor Damascus bears any part in the history of the iron trade a hundred years ago. We must look to Germany, to France, to Belgium, and to Austria if we would see how the continent of Europe stood at the date we are considering. It will be noted that I do not repeat the names of the two northern countries from which, in earlier days, Great Britain drew her supplies. Sweden and Russia barely count in the developments we are considering. From producing something like one-seventh part of the output of the world in 1830, they have fallen to producing but about one-eighteenth in 1905, though their total outputs have risen from about a quarter of a million tons at the earlier date to over three million tons at the later date.

The great ironmaking districts of Germany which lie in proximity to the Rhine owe their importance to the facilities of transport afforded by the river and by the railways which line its bank.

The works at Essen date from about the time at which my review opens, for the firm of F. Krupp was founded in 1810, but it is not till 1850 that Westphalia begins to play an important part in the history of the trade. By that time, already, it had become possible to transport the ores of the Seig and the Lahn to the coal districts. The discovery of the Bessemer process marks another step in advance. Bessemer compels Westphalia to bring ore from Spain, Gilchrist and Thomas restore to the native ores their importance. The basic process marks a great stride, and in 1879 the astonishing development of the German iron trade begins, the production of basic pig iron rising to 8,039,808 tons out of the German pig iron production of 12,293,825 tons in 1906, whilst the output of Bessemer pig iron was only 491,086 tons. Again, it is the possibility of bringing ore from distant countries to the fuel needed to smelt it that this region owes its present position. It may be permitted to a subject of King Edward to point out that here too a citizen of these islands appears as taking a prominent part, and to recall the fact that one of the chief collieries in Westphalia is called "Hibernia," in honor of the nationality of the man to whom the initiation of the enterprise is due.

With the help of Mr. Brough I am able to append to my address a chronological table of great interest. In it, under the year 1811, will be found the following entry: "Moyeuvre was purchased by François de Wendel from the French Government." I may be allowed to pause to welcome as a member of the Institute the great-grandson of that François de Wendel (himself a François), to express our grief at the loss we have sustained by the death of his father, who was a Bessemer gold medallist, and our satisfaction at enrolling the honored name once more on our lists, which have been adorned by those of his father and his uncle, Robert de Wendel. I restrain myself from telling the story, full of romance, related to me by the second François de Wendel, which is covered by the words in tthe Appendix: The spoliation by the revolutionary government in 1794, the years of suffering and of preparation under a foreign sky, the painful return and recovery of the family properties in 1803, and the building up of a great family industry—a monument of perseverance continued over four generations and through political changes to which I must do no more than allude.

Among the other great works in France to which I should like to refer are those of Le Creusot, which have a special interest to Englishmen, as they were partly owned at one time—in 1823—by an English company, Manby-Wilson & Company, who purchased an interest in them from a French company. They date from a somewhat earlier period than that with which I am dealing, but it was not till 1836 that they passed into the hands of Messrs. Schneider, by whom they were rapidly developed, till they became the important establishment to which we were welcomed in 1899. We are proud to have counted among our honorary members one of the founders of the Schneider dynasty, to have had his son as member and Bessemer medallist, and now to be honored by the presence of his grandson on our Council. Terre Noire is of about the same date, having been founded in 1819.

In Belgium the great establishments at Seraing call for mention. They interest us in this country since the founder was John Cockerill, a Lancashire man, who settled in Belgium early in the century to join his father in the management of a factory for the construction of spinning and weaving machinery, and in 1817 founded the works now under the management of our colleague on the Council, Mr. Greiner.

Our approaching visit to Vienna would make me wish specially to refer to the part borne by Austria in the wonderful story I am attempting to tell. The Austro-Hungarian Monarchy is also an example of the same process of development. The manufacture of iron dates from the remotest antiquity, but does not begin to attain to important figures till the introduction of improved methods of transport. In 1830 the output is said to have amounted to 80,000 tons. Fifty years ago this quantiy had grown to just under a quarter of a million tons, while to-day Austria-Hungary contributes over one and a half million to the world's output.

The American continent presents the matter in yet clearer terms. I am glad that the limits I have laid down for myself do not call for any account of the position of the trade in that vast country before 1776. The selfish and short-sighted policy which marked our legislation as to our colonial trade makes unpleasant reading for us to-day. I may pass to 1810, when the make of iron was under 54,000 tons, which compares with 243,851 tons made in Great Britain. In 1840 this had grown to 286,903 tons against Great Britain's 1,396,400 tons. This slow growth continues, the United States not reaching the 1,000,000 tons, to which Great Britain had attained in 1836, till 1864, nor the second million till 1872. By this time, however, the means of transport were improving with extraordinary rapidity. The production pauses between the second and third million for seven years, the reaction of 1876 sending it below 2 millions (1,868,961 tons), jumps from 2 3-4 millions in 1879 to 3,835,191 tons in 1880, stays for five years between 4 and 5 millions, rushes to 5,683,329 in 1886, and so

onwards till in 1905 it has attained 23,360,258 tons, out of the world's total of 54,610,269, to which Germany contributes 10,875,061, and Great Britain 9,608,086 tons.

Steam transport by sea and land, steam and electric-driven instruments for dealing with the ship's contents when they arrive at the discharging quay, have alone rendered these extraordinary results possible. The vast distances which so lately as 1890 made a judge as competent as my father doubt the possibility of utilizing the great deposits in the West have been reduced to insignificance, and the coal fields of Pennsylvania placed, commercially speaking, alongside the iron deposits of Lake Superior, from which they are separated by 800 miles of land and water.

But precisely because the distances in Great Britain were small, it was here that the first attempts to annihilate them by mechanical means were made. To this cause we must attribute the growth of the iron trade having in the earlier period been so much more rapid than elsewhere. When the century opened the production of Great Britain did not exceed one-quarter million tons. Even thirty years later it was considerably under three-quarter million tons, and about half the total production of the world.

By 1830 the improved means of support had begun to tell, and the progress in the mechanical arts to place better implements in the hands of the ironmasters. A glance at the chronological table shows what was taking place and absolves me from a catalogue of events. The next twenty years raised the British output to two and one-quarter million tons, out of four and one-quarter million tons for the world. In the following twenty years Britain more than doubled her output, which in 1870 reached five and one-quarter million tons out of ten and one-half for the world. By this time the means of transport first adopted in Great Britain had spread to other countries. The distances separating ore and fuel in America, in Germany, and in France were becoming of less and less importance, and by 1870 the total production of these countries was only about a million tons less than that of Great Britain. Ten years later, the three countries together produced as much as Great Britain In 1890 she was called upon to yield the premier place to America. In 1903 Germany overtook her, and now, for the year 1905, which is the latest date to which we have complete statistics, the pig iron output of the world stands as follows:—

Country.	Tons.	Percentage of Total.
United States	23,360,258	42.7
Germany & Luxemburg	10,875,061	20.0
United Kingdom	9,608,086	17.6
France	3,076,550	5.5
Russia	2,715,063	5.0
Austria-Hungary	1,540,896	2.8
Belgium	1,310,290	2.4
Sweden	539,437	1.0
Canada	403,449	0.8
Spain	383,100	0.7
Italy	143,079	0.3
Other countries	655,000	1.2
Total	54,610,269	100.0

This enormous quantity may well fill us with surprise. Some fifteen or twenty years ago my father expressed to me alarm at the rapidly increasing output of iron, and doubted whether the powers of consumption of the world were equal to disposing of the huge mass of metal. In this he followed Scrivenor, who, in the preface to the 1854 edition of his "History of the Iron Trade," remarks on the increase from 1,300,000 tons in 1840 to 2,700,000 tons in 1852, and proceeds:—

"This did certainly appear a matter of sufficient importance to justify an inquiry—especially considering the striking events of the period which had elapsed—as to the causes by which this enormous increase had been encouraged, whether to the advantage of individuals as well as of the country, and whether the supply is likely to be supported, or, on the contrary, whether reckless make has not brought us to a position from which—unless mineral fields, at present unknown, come into operation, with similar advantages to the blackband ironstone of Scotland—we must retrograde . . . and reduce the manufacture to somewhat more moderate limits."

That these fears were in both cases unfounded the sequel proved. In 1854 Cleveland was just about to enter on the scene with a production which, in 1855, was under 100,000 tons, by the end of the decade was 248,655 tons, in 1864 was 409,106 tons, rose to 1,158,471 tons in 1874, and continued to grow till it reached 2,213,584 tons in 1900, and now (1906) stands at the estimated amount of 3,600,000 tons. Within the last twelve months we have seen the world short of iron and clamouring for more, the clamour taking a form which the manufacturers regarded with much complacency, for it resulted in a large increase in price.

And when we ask how the world, which a hundred years ago was content with considerably under a million tons of iron, to-day calls for more when we try to satisfy it with upwards of fifty million tons, the answer is not far to seek. The ingenuity of man was not exhausted when our grandfathers invented railways and steamships. Iron gives place to steel. The puddling furnace having served its purpose, is tossed aside for the Bessemer converter. An instrument with which the arduous labor of several men produced in twenty-four hours about two and one-half tons of malleable iron, is rejected for one in which the forces of nature, guided by human skill, gives us thirty tons of steel in twenty minutes. Iron, but sparingly used when the century opened, is demanded in continually increasing quantities to-day. The iron trade, responding to the call of the world, seeks new methods for producing still better results, and would seem to be about to reject the Bessemer converter for the open-hearth furnace. The remarkable invention of the regenerative furnac made fifty years ago is being continually perfected. Even now the great improvement of a continuous instead of an intermittent process is touched.

If we ask whence come these manifold perfectionments, we are led to look to another aspect of the question. Those to whom were due the great improvements which one hundred years ago were beginning to be effected were, on the whole, men who owed little to schools or colleges. "Self-made," as the expressive phrase goes, it was to their indomitable courage and energy that they owed success; to these and to that inborn perception of the possibilities presented to them which school or college seems to do nothing to create and little to strengthen. But the first barriers broken down, and the pioneers having shown the way, the carefully trained mind is needed to make straight the path. It must be admitted that we in this country have been disposed to neglect that careful training of the mind, and to rely on the native powers of insight more than on the trained intelligence. The workshop rather than the college was the technical school in Great Britain.

It is significant that in the chronological table we find a German Technical High School at Prague mentioned as being founded in 1806, that the Chausthal School of Mines comes next in 1810. Long before the century opened the School of Mines of Freiberg in Saxony was in existence, having been founded in 1765. In 1816 France appears on the scene with a School of Mines at St. Etienne. Belgium in 1836 contributes the School of Mines at Liége, and in the same year Spain that of Madrid, and Austria that of Leoben in 1840, while we have to wait till 1851 before the Royal School of Mines in London appears. Since then we have indeed given much more attention to this matter, and the air is filled with projects for supplying those educational facilities which our fellow-workers abroad possess in such abundant measure.

For as the tools in our possession become more complicated, we must be better trained in their use. The empiric skill of the native genius, where imagination stands instead of knowledge, gives place to the learning acquired by the patient student at the technical school, and science supplants art at furnace and in workshop. If we in this kingdom are to keep our place in the world of industry, we must be ready to make use of the changed methods as our grandfathers were ready in their day to avail themselves of the forces newly placed at their disposal. For we, as they, look out on a world of perpertual change.

The men who stood on the threshold of the nineteenth century would have been filled with astonishment could they have foreseen the changes it was to bring, giving us a world in which time and space are all but excluded from our calculations. A telegram with which we greet a distant friend in America reaches his hand hours before the sun has travelled westwards to mark there the same time as it marked here when our message was despatched. Jules Verne, by the exercise of his imaginative art, told us how with great good fortune his hero encircled the world in eighty days. With no trouble to ourselves beyond taking a ticket from a tourist agency, we could travel westwards from London till we reached this city again from East in a day or two more than half that time.

But let me picture to you one who, one hundred years ago, should have said to the most skilled and far-sighted man of that day, "Within a century from now corn grown on the western slopes of the Rocky Mountains will be conveyed by steam along an iron road to the sea coast, borne over the sea in a ship made of iron and propelled by steam, and sold in the London market cheaper than it can be grown in Essex." Not one of his anticipations would have been thought within the range of the barest possibility.

Beyond doubt we, who stand on the threshold of the twentieth century, may look forward to changes as great and far-reaching before the next hundred years are run out. New forces are again being placed within our reach. The ultimate possibilities of the electric current are not yet within sight, though, with the eyes of faith, we may guess at them. It may well be that the steam engine will be as obsolete as the horse gin before the twentieth gives place to the twenty-first century, and that the new machine will be in truth the heat engine towards which the first experimenters worked. Our views of the constitution of matter are in a state of flux, and though the highly abstruse questions involved in this may seem far removed from these technical questions which chiefly occupy us, they are no more remote than may have seemed the discovery by Oersted of the deflection of the magnetic needle by an electric current. Yet that discovery contained the germ of the electric telegraph.

And if I to-day look forward, as I picture that other man to have done a century since, what form might my guess of the future take? How in a hundred years will the great swiftly-gliding ship of those days be propelled? With little, or mayhap with no machinery on board, with barely any crew she speeds on her way drawn by the electric force generated at Niagara, and transmitted over the Atlantic by wireless telegraphy. She crosses to New York, takes her cargo, and returns as she came.

Strange as my forecast may seem, it is no more incredible than what has happened since 1807. The things which to us are commonplace would have been deemed impossibilities by our forefathers.

The world moves on in a succession of dreams and their fulfilment. The wild imaginings of one age become the splendid realities of the next, for

". . . all experience is an arch wherethro'
Gleams that untravell'd world whose margin fades
For ever and for ever when I move."

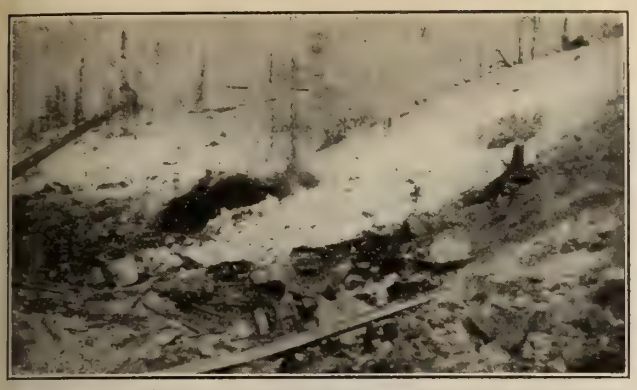
COBALT LAKE.

Cobalt Lake occupies an area of 51 acres in the heart of the Cobalt mining camp. The McKinley-Darragh location covers 3 1-2 acres of the southern end, and the remaining 47 1-2 acres are the property of the Cobalt Lake Mining Company, Limited. The company also owns a strip of 33 feet of land, half the road allowance, along the eastern side of the lake.

Early in the autumn of 1906 the Ontario Government announced its intention of selling to the highest bidder the mineral rights of Cobalt Lake. On November 22nd of the same year official announcement was made of the conditions of sale, and December 20th was set as the last day on which tenders would be received. The successful tender set the purchase price at $1,085,000. Of this amount about three-quarters was subscribed by an Ottawa syndicate, the remainder by Toronto and American capitalists. The whole amount was subscribed by about 670 persons. A marked cheque for $108,500 (10 per cent. of the purchase price) accompanied the tender.

A company was very rapidly organized, with an authorized capital of $5,000,000. Of this $4,000,000 was issued at once. Each subscribed to the purchase price received three shares of a par value of one dollar each, for each dollar of cash paid by him. This $3,255,000 allotment was made to the original subscribers. Brokerage and organization expenses amounted to $240,000. To provide for immediate development, $300,000 of treasury stock was issued. A considerable portion of this was taken up at 85 cents by members of the original syndicate.

During the latter part of the month of January, 1907, about one-quarter of the shore line was stripped. This work was necessarily unsatisfactory, on account of snow, ice and severe weather. In February, Mr. E. L. Fraleck



No. 4 Shaft Cobalt Lake, Beginning Sinking.

was placed in charge of the mining operations. Under his direction a force of 60 men continued trenching the frozen ground during the remainder of the month. Two veins were disclosed. North of the central part of the lake shore a smaltite vein two and one-half inches wide was disocvered, and a very high grade silver vein, about the centre of the shore line. The severity of the weather made continuous work impossible, but the results obtained by intermittent efforts were, at least, encouraging.

At present the entire shore line of the company's property has been partially stripped. On No. 1 vein a shaft has been sunk to a depth of 20 feet. On No. 2 vein, which consists of solid smaltite, varying from 2 to 6 inches in width, a prospect shaft has been sunk 40 feet. About 100 feet to the south of No. 2 an 18 foot shaft has been sunk of a 2 1-2 inch vein of niccolite, smaltite and calcite; and on No. 3 vein an 18 foot shaft has been put down. This vein is composed of solid niccolite and attains a maximum width of 18 inches. On No. 4 vein a shaft has been sunk to the depth of 80 feet. No. 4 carries good silver values and is composed principally of smaltite, niccolite and calcite, though considerable argentite, wire silver and occasional specimens of ruby silver have been encountered. On No. 5 vein a shaft has been sunk 80 feet. The vein varies from three to five inches and is composed of smaltite and native silver. No. 6, which is on the McKinleyDarragh line, has been sunk to a depth of 35 feet. It will thus be seen that a total of 291 feet of sinking has been performed, mostly by hand.

The shafts have a cross section of seven feet by ten in the clear, and are collared with a block skin to skin crib of hewn timber, affording a hoisting compartment five feet by five and a pipe and ladderway three feet by five. Below the collar the shafts are timbered with square setts in the usual way.



No. 4 Shaft Cobalt Lake, last week of February, 1907—Beginning Sinking.

In addition to these mining operations, the company has put up the following buildings:—

One cobbing house.
Two blacksmith shops.
One machine shop.
One oil house.
Compressor and boiler building.
Office building.
Eating and cook house.
Bunk house and stables.

All of these buildings are on the east shore of Cobalt Lake.

Two tubular boilers of one hundred horse-power each have been installed, and a fifteen drill cross compound air compressor will be in operation early in July.



Specimen of Niccolite Ore, Cobalt Lake, Showing Width of Vein.

Notwithstanding the depths attained in No. 4 and No. 5 shafts and their nearness to the lake shore, 23 feet in one instance and 15 feet in the other, it has not yet been found necessary to make any installation for pumping. No. 4 shaft, although it is over 70 feet below the water level of the lake, only makes about two barrels of water in a half-shift, and No. 5 about three barrels in the same period. These facts satisfactorily dispose of the apprehensions that water from the lake might be encountered in the early workings.

It is now the intention of the management to sink three main working shafts, one in the centre of the shore line, and one at each end. From these, when a suitable depth has been attained, the ground underneath the lake will be thoroughly prospected by means of drifts and cross-



No. 4 VEIN COBALT LAKE.

cuts. During the winter the lake was surveyed and laid out in in 66 foot sections. Soundings were taken at every 66 feet. It was found that the bottom of the lake is covered with a stiff clay, which will average a greater depth over the bottom of the lake than the actual depth of the water. This blue clay, it is supposed, will afford an impervious blanket, effectually preventing percolation, or seepage, from the lake into the underground workings.

The Cobalt Lake Mining Company has uncovered the continuation of the Nipising Cobalt vein, the largest cobalt vein in the camp. It has also struck the largest niccolite vein yet discovered. In addition to these, their three veins, Nos. 4, 5 and 6, are rich in native silver. Moreover, a continuation of the McKinley-Darragh veins into the lake may be counted upon. And all these do not exhaust the possibilities of the property. Most assuredly the property is well situated. It would be hard to pick out 47 acres in any other part of the camp, restrict the prospecting to a 33 foot strip and attain such results within a few months.



No. 5 Shaft Cobalt Lake, Middle of March.

At present the company has on hand 20 tons of niccolite, which averages 25 per cent. nickle and 5 per cent. cobalt; 12 tons of smaltite, averaging 15 per cent. cobalt. There are also 9 tons of first grade silver ore and a considerable quantity of second grade ore sacked and ready for shipment. This ore has been obtained from prospecting and development only. Drifts will be started out underneath the lake within a month. On Nos. 4 and 5 veins ore will be blocked out, and cross-cutting started to develope the niccolite vein at a depth of 85 feet. It is to be noted that the east shore of the lake shelves gradually towards the middle. This fact implies that at a depth less than that necessary to work safely under the lake, a certain amount of stoping can be done. In other words, a limited amount of ore can be blocked out and won between the shafts and the shelving shore at a depth of, say, 100 feet; while in all probability work cannot be commenced directly under the lake until the 150 foot level is reached.

Mr. D. B. Rochester, of Ottawa, is managing director. with office at the mine. Mr. E. L. Fraleck is the mine superintendent, and all the work so far accomplished has been arranged and caried out by him. The writer is indebted to both of these gentlemen for their kind assistance and hospitality.

THE MacMURTRY-ROGERS PROCESS

Continued from May 15th Issue.

Moreover, it seems probable that the small amount of water present near the zone of combusion aids materially in the desulphurization, acting in some way as a carrier of oxygen from hot material to the cooler material near the hot material; the effect being to slightly increase the quantity of oxygen present and so cause more rapid combustion, with consequent increase of temperature. To take the simplest case first:—

In the desulphurization of regule, if attempting to desulphurize this when dry and in a converter, very little action takes place; if water is added, metallic copper is readily produced. It was proved, in 1904, that this reaction takes place readily at a temperature just below the melting point of copper, as is evident from the porous structure of the product, which cannot have been completely fused.

Gautier* has recently observed this reduction of copper from cuprous sulphide by water vapor. but at a *white* heat; he formulates the reaction as:—

$$Cu_2S + 2\ H_2O = 2\ Cu + SO_2 + 2\ H_2.$$

This may possibly be the only reaction when only water vapour is present. When air is also blown in, sulphate of copper and oxides of copper can be shown to be formed in large quantities; these react with unaltered sulphide in the well-known manner. It seems also possible that some hydrogen peroxide may be formed thus:—

$$Cu_2S + 2O_2 + H_2O = Cu_2O + SO_2 + H_2O_2.$$

This hydrogen peroxide may quickly decompose at a lower temperature and give rise to a rapid evolution of heat at the point where it decomposes; owing first to the increase in the percentage of oxygen in the gas mixture at that point; and second, to the heat given out in the decomposition of the hydrogen peroxide. Any hydrogen formed by Gautier's reaction will burn higher up the charge and so transfer heat from the zone of combustion; some hydrogen appears to burn at the surface of the charge fairly long, and hot flames are seen above the hottest points on the surface.

The above conclusions have not, so far, been definitely proved, but have served very well as a working hypothesis. One can, however, be quite sure, from the nature of the product, that the ordinary reactions between oxides and sulphides and sulphate of copper can be carried out without melting these substances or the copper produced.

If the cuprous sulphide contains nickel sulphide, very little nickel is reduced, although both nickel oxide and sulphate are produced. In the ordinary reverberatory roasting process some nickel is reduced and a smaller amount in the bessemerizing of molten copper matte containing nickel. It seems to follow that the maximum temperature for the reactions—

$$2\ NiO + NiS = 3\ Ni + SO_2 \text{ and}$$
$$Ni\ SO_4 + NiS = 2\ Ni + 2SO_2.$$

is well above the melting point of copper; whereas the equivalent reactions with the copper compounds readily take place at slightly below this temperature. Steinhart has pointed out that it is not possible to reduce molten nickel sulphide by blowing air through it, as nickel silicate is produced.* In this process the nickel oxide and sulphate produced in the blowing operation readily form silicate when the product is melted down on a sand bottom, and give a slag with considerably more nickel in proportion to copper than is the case with the regule under treatment.

When a mixture of sulphides of copper and iron is treated, desulphurization proceeds rapidly if both water and silica are added, but not at all if either of these constituents is absent. Gautier states (*loc. cit.*):—

$$3\ FeS + 4\ H_2O = Fe_3O_4 + 3\ H_2S + H_2.$$

and also that

$$2\ Fe_2O_3 + 7\ H_2S = 4\ FeS + 3SO_2 + 7\ H_2.$$

when air is used in addition it is obvious that this hydrogen will burn, as also will the H_2S. It seems as if Fe_2O_3 is only a product of the reaction where the temperature is low. In a well-burnt charge of matte or ore, in this process. Fe_2O_3 is only seen at the side and top of the cake, that is where it has been cooled by radiation. If Fe_3O_4 is formed, one can understand that it readily parts with 1 atom of O, giving FeO—thus:—

$$Fe_3O_4 = 3\ FeO + O.$$

This atom of oxygen would help in the oxidation of FeS, and

$$FeS + O + O_2 = FeO + SO_2$$

The latter reaction would be very intense and may be a factor in heating up the particles to the point at which FeO and SiO_2 combine. This reaction is very important, and gives rise to a further evolution of heat, and any small portions of ferrous silicate formed will, in consequence, enhance the action in the neighborhood. In practical work, this formation of ferrous silicate and consequent sintering, can be seen extending outwards from the centres where the silicate formation first takes place. In this connection it is quite possible that water also acts as a carrier of oxygen by the alternate formation and decomposition of hydrogen peroxide, thus:—

$$FeS + H_2O + 2O_2 = FeO + SO_2 + H_2O_2$$
$$FeS + H_2O_2 + O_2 = FeO + SO_2 + H_2O.$$

and it seems possible that wherever oxidation takes place at a high temperature in the presence of air *and* water vapor, when the reaction requires an odd number of atoms of oxygen the other atom of oxygen from the molecule or molecules of oxygen will combine with water to form H_2O_2. This view has been brought forward by Armstrong and others in connection with the oxidation of carbon and carbonic oxide.

In the treatment of ore by this process the reactions involved are very similar to those occurring with matte, except that the passage of the zone of combustion upwards is preceded by the distillation of sulphur from pyrite and chalcopyrite. This sulphur must be allowed to escape to some extent, otherwise it interferes with the progress of the reaction by forming. a viscous layer of ore and molten sulphur. With both ore and matte charges the time factor is very important.

The reaction must proceed so rapidly that, at the zone of reaction, a sufficiently high temperature is kept up for the formation of ferrous silicate; otherwise ferric oxide is formed and decreases the amount of active oxygen in its neighborhood, when a diminution of temperature takes place, and causes a patch of unsintered material to be formed. If much Fe_2O_3 is formed at any point it does not appear possible to reduce it. The formation of ferrous silicate aids very materially in getting a product low in sulphur, as well as in sintering the material; for it probably acts as a carrier of oxygen to any particles of ferrous sulphide that may be originally included in it.

*Abstracts Jour. Chem. Soc., 1906, p. 548.

*Trans. Vol. XV., p. 233.

THE VALUE OF A MINE.

By J. B. Tyrrell, Mining Engineer, Toronto, Ontario.

What is the value of a mine? Probably most people to whom this question would be put would simply answer: "Just what can be got out of it."

But let us suppose that the purchaser is guided by rational business principles, and that he is buying a mine, or stock in a company owning a mine, as a good permanent investment.

In deference to prevailing conditions it will be assumed that the mine under consideration is owned by a joint stock company, and that the shares in this company can be purchased freely on the stock market.

The first point to consider, then, is how much money will the mine yield in dividends; and this is dependent on a number of conditions, such as:

1. How much marketable ore does it contain, or can be extracted from it? 2. How much will it cost to extract this ore? 3. What is its value at the mouth of the shaft? 4. What is the value of the plant and property, after all the ore has been extracted?

These are questions that the mining engineer must answer to the best of his ability. But after they have been answered as well as possible under all the known conditions, the further question remains to be answered: What is the present value of the property when a rational estimate has been obtained as to what dividends may be expected from it? It is to this latter question that some attempt will here be made to offer an answer.

It is probable that the majority of men who purchase shares in mining companies regard them in very much the same light as shares in other companies, with the added attraction of unknown possibilities in the form of new but usually very improbable discoveries of pockets of rich ore. The fact that investments in these two forms of companies are inherently different is generally disregarded.

Stock in transportation companies, banks, loan companies and industrial enterprises, if the companies are properly managed, may be expected to increase in value from year to year with the natural and regular growth of business. Thus, a company whose stock was worth par ten years ago may easily be worth 2 to-day, and ten years hence, with the natural enlargement of its business, it may be worth 4. For instance, stock in the Canadian Pacific Railway is worth four times what it was twenty years ago, even though additional stock has been issued to the shareholders on favorable terms in the meantime, and with the natural growth of the country the traffic and general business of this railway must still vastly increase, and the stock will become of still greater value.

Industrial enterprises might be cited to the same effect. The manufacture of agricultural implements has greatly increased in the past twenty years, and stocks in the manufacturing companies have correspondingly increased in value. There is no reason to suppose that the limit of this increase has been reached or approached. In fact there is every reason to believe that the value of these stocks will continue to increase with the continued increase in the volume of business.

But mining investments to be successful must be made on a different basis. Instead of increasing the mine is decreasing in value with every ton of ore taken from it, and the company owning it is living or deriving its profits in the using up of its capital.

When a man invests in railway or industrial stocks he feels that in the ordinary course of events and with the normal growth of business the value of his stock is sure to increase, so that when he wishes to sell he can get a little more than his original capital back again, and he consequently feels satisfied with a rather low rate of interest. He also feels that both his capital and interest are reasonably secure. There is no thought taken or no provision made for getting the capital back in a certain number of years, for the enterprise is intended to be carried on indefinitely.

A mine, on the contrary, not only decreases in value year after year as the ore is extracted from it, but production will cease altogether after a certain number of years, for the life of a mine is usually short. Dividends will then be things of the past. The investor in mining stock is therefore confronted with this condition, that he must look for the return of his capital along with proper interest on it within a limited number of years. Any investment in mining stock which does not provide for such repayment of capital is certain to be disastrous to the investor in the end. The dividends must include a sinking fund to replace the capital and interest at a rate commensurate with the risk incurred.

When this principle is thoroughly understood that dividends of mining companies must provide for the redemption of capital, as well as for payment of interest, the next questions that present themselves and the demand answer are: How many years should be allowed for the repayment of the capital, and therefore what percentage of it should be repaid each year in the dividend? And in addition to this, considering the possibilities of failure of the enterprise altogether, what interest should be looked for on the investment?

(To be Continued.)

NOTES ON THE MINERAL FUEL SUPPLY OF CANADA

By R. W. Ells, LL.D.

(Abstract of paper read before the Royal Society of Canada.)

(Continued from Page 212.)

The carefully detailed work of Mr. Hugh Fletcher has revealed the existence of a possibly important coal basin southwest of Springhill, along the north flank of the Cobequids. A coal seam was struck by boring, at the depth of 2,000 feet.

Small seams, such as those at Debert, outcrop on the south side of the Cobequids in formations other than the productive coal measures.

The Province of Prince Edward Island does not show the presence of any coal seams. Since all the rocks of the island are Upper Carboniferous or Permian, coal if existing at all, must be sought for at a great depth. There are, however, several peat bogs of excellent quality.

In New Brunswick the Carboniferous rocks have a very wide distribution and comprise an area of more than 10,000 square miles. At many points throughout this area thin seams outcrop, and near the upper end of

Grand Lake, where the coal appears to have the greatest thickness, it has been mined for nearly a century. The main seam is 20 inches thick; but in places where two seams unite a thickness of two and one-half feet is observed. The annual output amounts to about 40,000 tons. Boring operations have been carried on throughout the coal basin for over sixty years without finding any seam better than this.

At various points in New Brunswick, outside the limits of the principal coal basin, small seams of coal are found, some of which belong to a different horizon. Among other sources of fuel supply in this Province must be mentioned the Albert shales and the associated mineral, Albertite. Rich beds of oil shale, styled Cannelite, also occur as interstratified beds in the mass of this shale. The Albert shale formation has a thickness of over 1,000 feet. The strata are usually highly inclined, and there are numerous faults and occasional overturns. The Albertite occurred in the mass of this shale near the axis of the anticline, as the filling of a true fissure having a width varying from a few inches at the ends to about seventeen feet in the centre, decreasing in depth to the bottom of the deposit about 1,500 feet from the surface. The vein showed several faults, the mineral being thrown from side to side. It was mined to a depth of over 1,200 feet, when it assumed a brecciated structure, fragments of shale being cemented by the Albertite. These shales are regarded as of Devonian age.

Massive bands of grey and black oil shale from three to twenty feet thick, interstratified with the bituminous shale, yield from thirty to eighty gallons of oil per ton. They are readily inflammable, and though the ash is very high (45 to 60 per cent.) they evolve a great heat. In ease of extraction and in percentage of oil contained, these shales are superior to those mined in Scotland. The main vein was worked for twenty years. It yielded 204,000 tons before exhausted.

Comparing the beds of Cannelite with true cannel coals, it may be remarked that with the exception of the large amount of ash in the former there are strong points of resemblance. The associated Albertite is a highly altered petroleum, analysis showing the merest trace of ash.

Coal does not occur in Quebec in commercial quantities, but the development of the peat industry in this Province. as well as in Ontario, bids fair to furnish for certain purposes a fuel which will to some extent supply the absence of beds of true coal. The development of the peat bogs in the country between St. Johns and Farnham, and also near Bulstrode, Arthabaska County, was begun about forty years ago. Being uncompressed, the peat was not suitable for railway work. But now peat, after extraction of the contained moisture down to 12 or 15 per cent., is compressed into small cylindrical blocks having almost the hardness and consistency of coal. Peat bogs are extensively developed in many portions of the Province, and the manufacture of the compressed fuel has reached the stage where the demand exceeds the supply, and it readily sells at a good profit on the cost of manufacture.

In Ontario true coals are nowhere found; but deposits of anthraxolite and lignite occur, the latter in large quantities in the area south of James Bay. This lignite of the Moose River basin is found in Post Tertiary deposits of sand gravel and boulder clay, instead of in solid rock formation, as is the case with the lignites of the west. The seams are of considerable thickness and the lignite when dry burns readily. It is of brownish-black color, and burns freely in an open fire. It cannot, however, compare with the Tertiary lignites of the west. The lignite and peat deposits have not as yet affected the importation of coal.

Petroleum was first discovered in Ontario in 1860. The subsequent finding of immense quantities of natural gas added largely to the light and fuel resources of the Province. The original field from which Ontario petroleum was first obtained is still a producer, though the supply in recent years has materially decreased. The discovery of natural gas about fifteen years ago in the place where petroleum was first known, and later in the Niagara Peninsula, has largely affected the coal consumption in some districts. Not only have local requirements been met, but immense quantities of gas have been piped to Buffalo and Detroit, on the American side.

In the western half of the Canadian section, beginning with the great plain of Manitoba and extending across to the shores of the Pacific ocean, many of the rocks over large areas comprise Cretaceous and Tertiary sediments. In these the greater part of the coals of the western division are located. In Manitoba and throughout the great plains east of the Rocky Mountains, and extending northward down the valley of the Mackenzie River to the Arctic Ocean, the rocks are largely of Cretaceous age. The district is underlaid in many places by large beds of lignite. Outcrops are seen as far east as Turtle Mountain in Manitoba; and along the North Saskatchewan as far as Victoria these lignites are seen, sometimes in beds of great thickness.

Passing west into the foothills of the Rockies, as at Banff and as far south as Crow's Nest Pass, the lignites change their character and pass into lignitic coals, bituminous coals and anthracites. Of this wonderful series of coal beds, which at Crow's Nest is 200 feet in thickness, many seams are large and of superior quality.

(To be Continued.)

The Hon. the Minister of Mines has authorized the preparation of a report on the mining and metallurgical industries in Canada, embodying the following information: Name of company, date of incorporation and charter, authorized capital, value of shares, directors and officers, head office, Canadian office, number of men employed, wages, transportation facilities, market and prices. The following additional information is sought regarding the mining industry: Mining land owned and controlled, class and character of ore mined, average quality of ore(analysis, method of mining, treatment of ore, if any cost, cost of mining, drilling, explosives, hoisting, transportation, general expenses), total cost per ton of ore raised. For the metallurgical industry the following information is asked: Location of plant, ore treated, quality of product. method of treatment, description of machinery and apparatus used, source of supply of raw material, composition of raw material, cost of production. It is proposed to report only upon producing mines, mines under development and established metallurgical plants. The present rapid progress in and the changing conditions regarding such factors as labor, market and prices will necessitate supplementary annual publications to bring the information of the original report up to date until the changes and new material call for the issuance of a complete new report.

THE COBALT MINING DISTRICT.

By Dr Robert Bell, F.R.S., Ottawa, Ont.

(Toronto Meeting, 1907.)

In the present paper the writer proposes to confine his remarks mainly to some points in connection with the geology of the Cobalt district and the nature of the metalliferous deposits, the most important of which are those of silver.

The silver-bearing area is comparatively small, the most productive portion, so far as known, not exceeding about fifteen square miles, although fresh discoevries are being made, some of which tend to increase the area. The general appearance and the physical characters of this area are similar to those of the region which surrounds it for many miles. It is an undulating, rocky, forest-clad district, with numerous small lakes among the hills, which latter are not high or conspicuous, the general aspect, on the large scale, being that of a mammillated peneplane.

The centre of the productive area is about three and a half miles west of Lake Temiskaming, in latitude 47 degrees 30 minutes. The rocks within the above fifteen square miles belong to the series, all of which was formerly called Huronian.

A few words of explanation may here by advisable in reference to the history of the Huronian system, and the evolution and nomenclature of the divisions which are now more or less recognized by geologists. It is well known that some sixty year sago the whole of the upper series of the azoic or archaean was called Huronian. This was before discovery had advanced sufficiently or geologists had had time to properly classify and sub-divide the great series of crystalline rocks overlying the Laurentian, which Logan and Murray had already found in the region of Lakes Huron and Superior.

It required much time and labor to ascertain the general nature, the importance, the geographical extent and distribution, the volume and the probable natural divisions of the system. While the whole series may be described as of a pyro-clastic type, an igneous character prevails towards the base and the sedimentaries become more and more abundant and diversified towards the top. The underlying igneous type has been called the Keewatin division, while the term Huronian has always been applied to the higher portions, and this may be again separated into the lower and upper Huronian, although no continuous dividing line has been established.

One of the characteristics of the Huronian proper is the want of continuity of any particular belt or division. The lithological divisions which may exist in one district all thin out and terminate in both directions, and gradually become interlocked or dovetailed with new formations which gradually introduce themselves from both sides. In other words, a general cross section of the Huronian, covering a considerable distance, would show a series of interlocking lenses of different rocks, which are gradually replaced on the strike by other kinds. For this reason an identity or difference in any set of these rocks in widely separated localities is no criterion as to a ismilarity or a difference in age.

The recognized Keewatin rocks of the Lake of the Woods lie at a distance of seven hundred and fifty miles in a straight line from the Cobalt district, and the two formations have not yet been separated from each other in any part of the intervening distance, in the course of which the Huronian areas are broken up and separated by wide intervals of the Laurentian. Too much stress, therefore, should not be laid on differences of age which are supposed to exist among the rocks of the Cobalt district. It may be better to defer an exact separation and classification until some general work in this line has been done over this great interval and until this whole subject is better understood. It is worthy of notice that some persons who make frequent use of the word Keewatin apparently believe that it is a lithological term, like conglomerate, diorite, slate, etc., and could point out where a few yards of it might be seen. The writer should here observe that he has done no work personally in the way of mapping out and classifving the rocks of this district, and as the geologists who have been engaged upon it do not agree, it might be better for the present to confine our geology to making as correct a petrographic map as possible, which is all the prospector or the miner requires, and leaves the classification to be determined later on.

The silver-bearing rocks have so far been found to consist of massive or crystalline diabase, but more especially of a volcanic breccia or agglomerate having a bluish and grayish matrix consisting of hornblende porphyrite, while the contained fragments are mostly reddish and grayish granite, together with others of the porphyrite itself and various forms of greenstones. The fragments are generally of rather small size and mostly angular or subangular, although in some parts many of them are more or less rounded. They stand at all angles in the mass and are very irregularly distributed; sometimes well scattered throughout considerable volumes of the rock, sometimes occurring in large and small bunches or "flocks," or they may be sparingly distributed or almost entirely absent. This agglomerate has a general horizonal attitude and is the rock which is most in evidence at the surface in the more productive parts of the district. Associated with the two kinds of rocks which have been mentioned are fine-grained drab and gray slatey rocks and dark and light colored greywacke, passing into impure quartzite. These also lie horizontally or conformably with the great sheet of brecciated hornblende porphyrite.

In the Cobalt district itself, the brecciated rock extends beyond the silver-bearing area and the same breccia occurs abundantly on Lake Temagami, around Rabbit Lake, and in other parts of the region, but holding little or no silver, as far as known. The presence of the silver at Cobalt would therefore appear to depend upon an original local impregnation of the parent breccia and diabase with the metal. It would therefore appear to be a mistake to suppose that silver is to be looked for wherever the breccia is found. The occurrence of the silver in the Cobalt district appears to be regional and to be confined (with some exceptions) to a comparatively small area. This is not the only example we have of these local occurrences of a certain metal. The great abundance in this same locality of the hitherto rare and expensive metal, cobalt, affords another example of this phenomenon. The immense deposits of nickel, within a very limited area at Sudbury and in New Caledonia on the opposite side of the planet, belong to this mode of occurrence. In various parts of the world, some of the other metals, such as tin, mercury, platinum and manganese, exhibit the same tendency to regional limita-

ion. Only the other day it was announced that the hitherto rare metal tantalum had been found in great abundance at a single spot in Australia The cause of this local or circumscribed occurrence of certain metals has not yet been explained, any more than the reason why the specific gravity of the whole earth is more than twice as great as that of the average materials which form the crust. The latter fact is probably owing to the existence of various heavy metals at great depths and the former to the occasional ejection of one or more of these from great depths, especially during early periods of the earth's history.

Some of the shafts in the Cobalt district have been sunk in the agglomerate and the associated slatey ash rock and arkose, and this rock formation is supposed to have a total thickness of upwards of three hundred feet. It is traversed by two sets of vertical joint planes, recalling the jointed structure of argillites, clay slates, etc. One of these sets has an average course of northeast southwest and the other is at right angles to this. The silver-bearing part of the district is also traversed by fissures or planes of disturbance, along which, from time to time, the rocks were crushed by slight movements, under great pressure, forming spaces in which mineralizing waters could rise from considerable depths. The agglomerate and perhaps the whole of the crust of the earth to the very surface would probably have an elevated temperature at that time, while the waters from a depth would be still hotter. On approaching the surface they would be relieved of pressure and somewhat cooled.

The reason why some mining men, on visiting the district in the earlier days, did not appear to be favorably impressed, seems to have arisen from the fact that nearly all the veins were small; few of them were well marked or continuous for any considerable distance. In fact, most of them lacked the typical character of good fissure veins of the ordinary kind. When development had proceeded far enough and a sufficient number of openings had been made to enable one to properly observe the phenomena, it became evident that the supply of ore did not depend upon the individual small veins, but that there was some more general kind of mineralization. This the writer believes to be connected with the above planes of fracture or disturbance which are more continuous and deeply seated than the small individual veins on and near their course. The fisure plane may, in places, be indicated by only a small vein or a dry fault without any vein matter or gangue, but the wall rock itself along such sections of the general rent will often be found to be rich in silver for some inches or even a foot or two inward from the line of fracture. Small cracks and branch veins running out from the main fissure may carry the silver to a great distance into the country rock.

If the above view be correct, a continuous production of the silver is to be looked for by following these vertical zones of crushing and disturbance. Among these planes, the temporary formation and subsequent breaking up of veins, from time to time, was only one of the phenomena of their history. In some instances especially where the line of fracture has been nearly straight, the vein or group of veins has not been thus broken up, but has preserved its contiuity for some distance and has become enlarged or has produced new parallel veins by widening of the fissure. La Rose vein or group of veins appears to be of this character.

On the other hand, there are usually many minor irregularities in both the horizontal and vertical course of the lines of dislocation, and at any new movement of the walls there would be a fresh breaking up of the materials which had accumulated along these lines and new spaces would be found for further mineralization. This repeated brecciation has resulted in what we now see in the "mines" opened on these lines of disturbance. Both the vein matter and the wall rock are much split and broken up; dislocated fragments are cemented together along lines of small faults and there are many miniature horses surrounded with the cementing gangue. Secondary dislocations, branching from the main one, are often rich in silver, which may also penetrate into the shattered wall rock and form a body of rich ore, even if the vein matter be of inisgnificant amount or altogether wanting. The foregoing explanation of the formation of the mineralized zones and of the mode of occurrence of the silver in the Cobalt district was given in the writer's report on the district, published in the Summary Report of the Geological Survey for 1905.

The volcanic nature of the fragmental rock of the Cobalt district is manifest both in fresh fracture, and on every weathered surface. One of the localities where this is particularly convincing is the south-facing slope of the hill near opening 12, 13, 15 and 21 of the Nipissing Mines Company and not far from the power house at the shore of Peterson Lake, on lot R. L. 404. Here the rocks have been well exposed by recent hydraulic washing and show very distinctly their volcanic or plutonic character. Areas of different varieties of diabase and agglomerate are mixed together and cut by dykes which have evidently been formed before the masses which they traverse had been completely hardened by cooling. At the contact, some of the dykes became amalgamated with the rocks they penetrate and have no sharp line of division. The smaller dykes are in some instances broken and interrupted, as if by the movement or flow of the semi-fluid mass into which they had been intruded. The weathered surfaces of different adjoining small areas of the diabase present different shades of color and different degrees of texture. Some of the brecciated parts show large inclusions; some are irregularly charged with the brecciated debris, while other parts are quite free from it. A cherty rock, having lines of foliation, is associated with the foregoing. A few small veins containing smaltite and argentite traverse the diabase and the agglomerate at this locality. Lines showing limited faulting or dislocation also occur in these rocks.

Up to the present time, twelve or more different metals, either native or combined with one another or with other elements, have been found in these rocks, and this fact alone would point to an igneous rather than a sedimentary origin of the matrix.

In connection with the supposition that some of the rocks of the Cobalt district may be co-related with those which have been called Keewatin, at the Lake of the Woods, and the unfounded theory that the Keewatin rocks are not argentiferous, the fact may be mentioned that the leading feature of these Lake of the Woods rocks is the prevalence of greenstones, having a concentric spheroidal structure. On the Lawson property, which lies immediately southwest of Kerr Lake, the writer found, near the centre of the lot, an exposure of a dark greenish gray, rather fine-grained diabase, having a conspicuously concretionary structure. The sections of the spheroids are nearly circular and vary from six inches to three feet in diameter, the average being two feet. This rock is here cut by a well-defined vein of smaltite with silver, and several other silver-bearing veins occu rin the immediate vicinity.

The foregoing opinions as to the Cobalt district have

not been formed as the result of a single visit to the camp, but have been gradually matured by five different visits to the district. There is a great advantage in paying repeated visits to any locality of geological interest. In the intervals between examinations one has time to think over what he may have seen and to consider points on which he requires further evidence in order to clear up uncertainties or doubts.

EXCHANGES

The Coal Trade Journal for June 5th contains a leading editorial "The State of Trade."

The Mining Journal, June 1st, contains its usual valuable summary of the world's doings in mining.

The Maritime Mining Record, June 12th, opens with a short paper on "Coal Dust," which discusses the explosion of coal dust, in the absence of fire-damp.

The Journal of the Franklin Institute for June contains a paper on "Change of Structure in Iron and Steel," by W. Campbell, Ph.D., of Columbia University.

The Iron and Coal Trades Review, May 31st, takes up "Coalite," the new smokeless fuel. Apparently "Coalite" has failed to substantiate the claims of its promoters.

The Iron and Coal Trades Review, June 14th, devotes a page to the new fuel, "Coalite." The analysis of "Coalite" is stated to be: Carbon, 80.00 per cent. volatile matter, 12.00 per cent.; sulphur, 1.00 per cent.; ash, 7.00 per cent.

In *Fuel* for June 11th there is an article on the application of Texas lignites to the production of power by producer gas methods. It is stated that a ton of lignite will produce 90,0000 cubic feet of gas at a delivered cost of not more than 1 cent per 1,000 feet.

In *The Mining World,* June 22nd, Ralph Stoke continues his article on "The Tasmanian Tin Industry." A third paper on "British Columbia Placers," by Horace F. Evans, gives evidence of very intimate acquaintace with the alluvial gold deposits of that Province.

In the Mining Reporter, June 6th, C. C. Lane writes of "The Development of Chilian Mills." Of the Chilian mill the writer says: "When stamps reduce to one-quarter inch they can be credited with three-eighths of the duty, and the Chilian mill is entitled to a credit of five-eighths.

The Engineering and Mining Journal, June 8th, opens with a strong article on the "Metallurgy of Aluminium in 1906" The writer is Professor Joseph W. Richards. He states that the capacity of aluminium reduction plants will be enlarged very considerably during 1907 and 1908.

The Colliery Guardian, June 14th, contains another instalment of "Evidence Taken Before the Royal Commission on Mines." Watering of coal mines to obviate coal dust explosions was the subject of a great deal of the evidence taken. In a certain Welsh colliery the actual cost of watering was 1.72 penny per ton. This included the cost of all fixtures, etc., and of hauling water in tanks.

The Mining Journal, June 15th, in commenting editorially upon the Indian Geological Survey Report for 1906, notes that there is in India "a disposition to turn to the mineral occurrences promising the requisite raw material for the creation of local industries, for the success of which the great home market and abundant cheap labor afford good prospects. Such a result, while satisfactory to the country, is bound to diminish the interest felt by European mining capital in India."

The Mining and Scientific Press, June 8th, has an article on "Acid Flotation Processes at Broken Hill." The Broken Hill ore assays 16 per cent. lead, 15 per cent. zinc and 11 ounces of silver. Formerly only 65 per cent. of the lead and between 45 and 50 per cent. of the silver were saved. A recovery of 80 per cent. is now possible. The ore consists of an intimate mixture of galena, blende, rhodonite, garnet, quartz and calcite.

The Engineering and Mining Journal, June 22nd, opens with a very interesting account of the "Medical Department of the Colorado Fuel & Iron Company." This company maintains, besides the magnificent Minnequa Hospital at Pueblo, with accommodation for 210 patients, a dispensary at the Minnequa steel plant, two emergency hospitals in remote camps and dispensaries and resident surgeons at all its properties.

The Mining Journal, June 8th, in a capable editorial takes up the annual report of the Egyptian Department of Mines. An excerpt from the report speaks thus of blanketing: "The large concessions that exist in the hands of a limited unmber of people incapable of developing them still form a big obstacle to the opening up of the country. However, by the end of 1907, nearly all of them terminate, and it is anticipated that considerable local interest will then be taken."

The Mining and Scientific Press, June 15th, in a vigorous and characteristically incisive editorial on "The Trial at Boise," discusses the "orgy of brutality" which led up to the trial. "We venture to attribute it, as we attribute many other ills from which we suffer, in the very midst of a triumphant industrial progress, to the absence of a strong public opinion in support of the law." Any excerpt fails to reveal the strong, judicial spirit of this editorial. It is most worthy of careful perusal.

South African Mines, Commerce and Industries for April 6th demonstrates the advantages accruing to the users of the tube mill as an accessory to the stamp mill. The manager of the Rand Mines group reports that the 23 tube mills employed by the mines under his charge have increased the duty per stamp from 5,170 tons per day in 1905, to 5,672 tons in 1906. The extraction was increased from 89,877 per cent to 93,858 per cent. The reports of individual companies of the Eckstein group confirm these figures.

The Science and Art of Mining, June 15th, gives the first instalment of a very interesting article on "Coal Mining in the United States." The writer's point of view is British. "The only sphere in mining in which they (Americans) surpass the British is in the use of mechanical coal-cutters." Referring to haulage, the article continues to this effect: "Haulage is mostly accomplished by mules and electric and compressed (air) locomotives, very few endless ropes or main and tail rope installations being at work. Mule haulage in small mines may be cheaper, and for the time being efficient, but in a large mine mules are nothing but a costly nuisance . . . In the State of Illinoise alone, and it is typical of the Republic in this respect, 80 per cent. of the mines use all mule haulage . . . At some of the mines the treatment of the mules is cruel and inhuman."

Canada' Mineral Exhibit at the Dublin International Exhibition.

(Contributed.)

The mineral resources of Canada are graphically illustrated by the mineral exhibit in the Canadian Pavilion, in connection with the Irish International Exhibition, now being held in Dublin, and are a source of great interest to a number of European mineralogists in attendance at the big Irish Fair.

Geological and mineralogical authorities who were studying the Canadian mineral resources agree with the Canadian authorities that the mineral wealth of Canada, up to the present located, is small in proportion to the value, variety and number of deposits that remain to be discovered, and are not surprised that every year a new crop which makes individuals rich and adds to the general wealth of the nation is discovered, sufficiently important to arouse the interest of the world.

The discovery of gold in the Yukon, in 1897, the immense wealth of silver at Cobalt, in Northern Ontario, and likewise the deposits of the gold, silver, copper and immense quantities of asbestos at Chibougamoo, in the Province of Quebec, have set the European students of mineralogy thinking.

The mineral exhibit in the Canadian Pavilion at the Dublin Exhibition is quite large and comprehensive. There are 1,049 different exhibits, including a large display of cobalt, nickel, arsenides and silver ores of Ontario, together with asbestos, mica and corundum, which are the chief exhibits. There are fifteen exhibits of the manufactured products of corundum selected from the industrial centres of England, France, Germany, Belgium, Russia and the United States, that use the corundum ore, and goes to demonstrate its general use. In fact, all the Canadian ores are well represented.



CANADIAN MINERAL AND METALLURGICAL EXHIBIT—DUBLIN.

The exhibit also contains Canadian anthracite and bituminous coal. Building and ornamental stone are

very complete, with special interest taken in the display of granites. The gold exhibit in quartz and dust, from the Yukon, British Columbia, Quebec and Nova Scotia, represent 125 specimens that show the wealth of the country. An exhibit of pig iron produced by the Electro-Thermic process is very interesting to the European scientist, and shows the great possibilities in the iron ore deposits of Canada.



CANADIAN BUILDING—IRISH INTERNATIONAL EXHIBITION, DUBLIN.



CANADIAN MINERAL EXHIBIT DUBLIN.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay, 10th June, 1907.

The Dominion Coal Company have just acquired a Dräger breathing apparatus, and are purchasing nineteen more, making an equipment of twenty sets, with the various oxygen cylinders, refill pumps, and the necessary accessories. Their intention is to erect a rescue station on European lines, and they will train men in the use of the apparatus. This is, we believe, the first modern apparatus of this kind that has been imported into Canada for use in mines. (A full description of the apparatus is to be found in the issue of this JOURNAL, dated 15th April.) The matter of the provision of life-saving apparatus of this kind is at present engaging the attention of a Royal Commission in England, and very recently the United States Government sent over a representative to study the German and French stations on the ground. There is without doubt a pressing need for some such provision in the mines of this continent, and the Dominion Coal Company are to be congratulated on their wise initiative. Many lives have already been saved in European mines by the use of breathing apparatus, and although at the memorable catastrophe of Courrieres the Westphalian Rescue Corps arrived too late to save any lives, yet they rendered very valuable assistance in reopening the mines and removing the dead. Since then breathing apparatus of several types havs been used in mine explosions, and one doubts whether any modern mining company can afford to be without them.

The work of reopening the Hub Mine is progressing satisfactorily, in spite of the delay which has been occasioned by the destructive nature of the mine water. The mine is being cleaned up underground, and very little damage appears to have resulted from the flooding. The fire affected mostly the upper workings, which are old and practically exhausted, and did not travel to the deep. It is hoped that hoisting will be resumed towards the end of August. The surface erections are rapidly nearing completion, and the re-screening plant for the central banking station is already in operation. Considering that the fire made a clean sweep of all the surface buildings, with the exception of the boilers, the Coal Company's officials are to be congratulated on the expeditious manner in which they have gone to work.

At Reserve Colliery also the new bankhead replacing the old structure that was burnt to the ground last October is in operation, and is a very decided improvement on its predecessor, which was one of the things that "just growed," and looked it.

The new shaft to the Emery Seam is also completed, and hoisting coal. This mine has now 500 feet of longwall face, and is putting up about 500 tons per day.

Having now got rid of the ice blockade, which so restricted operations in Cape Breton during the month of May, the Dominion Coal Company, along with all the other operators in the Island, are being hampered by the disinclination of their workmen to descend the mine after pay day. This condition of affairs appears to be getting worse, and augurs badly for the output during the "picnic season." How serious a drawback this habit is to the mining companies may be gauged from the fact that during the week preceding the pay day of the first of June the average output of the Dominion Coal Company's mines was 14,800 tons daily, whereas in the week following the pay day it dropped to 12,600 tons. This means a dead loss of tonnage to the operators of at least 20,000 tons a month, a very serious matter when the limited season of navigation is taken into consideration, together with the fact that the fixed charges of the mine and the organization necessary to produce the larger tonnage is in no way reduced to correspond with the post-pay-day yield. What the remedy is for this state of affairs is not at all clear, but that a remedy is needed is very obvious. This is further a reduction in wages that the Provincial Workingmen's Association might well take under advisement, as 20,000 tons per month additional output would mean quite a little in the pocket of the Cape Breton miner.

STELLARTON.

How easily some folk allow themselves to fall into the blues! Any temporary impediment to their progress sends them to the verge of collapse. The backward drop of the shipping season led some to give utterance to the belief that we had lost so much in coal shipments, that 1907 would show a falling off. It will need a good deal more than a week or two's lateness to supply sufficient ground for any such belief. We have been told, for instance, in the papers that the unfavorable weather conditions mean a loss in shipments to the Dominion Coal Company of some two hundred thousand tons. Nonsense. One cannot judge from the shipments of five months what the year will bring forth. Let me take a glance at the shipments of the Dominion Coal Company for the first five months of seven years, and see what they declare. The smallest shipments in five months for seven years were in 1905, when only 824,000 tons were shipped. The heaviest shipments in the first five months of any year was in 1903, when the large quantity of 1,111,700 tons were shipped. And yet what happened before 1905 was out? Though handicapped by short shipments in the first five months of nearly 300,000 tons, it beat 1903 by over 100,000 tons. The shipments for the five months of 1907, of the Dominion Coal Company, are 68,000 tons behind; but if 1905, badly behind, beat in the long run its predecessors, why not a similar thing happen again? The coal trade is a peculiar business. It is stated that some of the managers are eagerly on the lookout for new customers, while they have booked more orders than they can, to use a common phrase, "Shake a stick at." How is this, I wonder? The reason presumably is that though the managers are at times very neighborly bodies, each is careful that the other does not get ahead in any way. Our managers are good fellows; yes, and diplomats to boot. When in meeting all are chivalrous. Not for worlds, for the life of him, would one hint that some other had been poaching in his precincts. After the meeting, however, one or two, it is said, give relief to their feelings in a foreign language. This may be idle rumor only. I believe the I. C. R. contract will not be awarded, as expected, in the beginning of July. It is hinted that some of the agents of the Coal Companies have asked for delay.

Scarcity of labor is still the cry at many of the collieries, though a few immigrants are dropping in occasionally. Skilled labor is not quite so scarce as unskilled. A large proportion of the skilled labor which finds its way into Nova Scotia from Britain does not, it seems, easily adapt itself to conditions in this country. Many men after being a time in the country hie away to the United States, where they think work is easier and the conditions similar to those to which they have been accustomed. At some of the mines it takes an old countryman fully twelves months to cut as much coal and as easily as a native born. We will never have again in Nova Scotia a sufficient supply of native labor to meet the increasing requirements of our mines. Therefore we shall be forced to look abroad. From what I had read in the United States papers, I had come to the conclusion that it might be as well that the progress of the coal trade be retarded, than that it be furthered by the importation of Huns, Poles, Slavs, etc., as in the United States. I have since, however, been induced to believe that the men of Poland are not a bad lot when rightly treated. It is said they are more amenable to the discipline of the mine than natives. Their ignorance of our ways and of our language may lead them into serious faults, as was the case the other day, when two Belgians were found quietly smoking their

pipes in a mine in which safety lamps were in use, and, of course, pipes prohibited. But the poor fellows did not know they were breaking a law. Their offence was overlooked, and yet what might it not have led to? As remarked in the *Mining Record*, it may soon become necessary to print the special rules in more languages than the English. The members of the P. W. A. might prefer but one language, and that none be permitted to enter a mine who did not understand it. That desire complied with might mean the crippling seriously of some mines. I notice that hereafter the Manitoba Government will convey coal lands to no man who will not enter into bonds to give every countryman who comes with his team to the pit as much coal as he can use for a dollar and seventy-five cents per ton. That either means that the coal mine operator will work for nothing or else salt those who do not take the coal away in farm wagons. Some down here are under the impression that miners out West demand more wages than those of the East. That will not be possible with a dollar seventy-five cent coal, unless the mines in Manitoba make no water, require no timbering and have very soft coal. The wage bill alone of one of the Nova Scotia collieries was $75,000, and the coal raised was less than 35,000 tons. That gives two dollars a ton for labor, without counting material, royalty, or fixed charges. Some reformers down here hysterically call upon the Provincial Government to undertake the working of a coal mine. If the Government only would it would result, so they say, in cheaper coal and bigger wages. Just how the Government is to do this marvellous trick is not explained. It is quite possible that if the Government selected a favorable area it might for a time, and not providing for the future, or for contingencies, which in coal mining may mean the wreck of the pit by an explosion, give the people, or some of them, two dollar coal. But what would it do when the mines became deep and costly? Would it abandon deep mines and begin again, in a new place? The people would permit no such utter folly. There are in one county alone of Nova Scotia at least 24 abandoned mines. Why are they abandoned? Not because all the coal has been extracted, but because when fire or explosion took place, and there being in these days what was supposed to be a superabundance of coal, the company found it cheaper to open a new mine than go to the trouble of reopening and recovering the old. Sixty years ago the General Mining Operators abandoned a pit in Cape Breton because the coal was more expensive to work than it would be in a new mine. That old pit was reopened some time ago by the Nova Scotia Steel & Coal Company, and the coal is actually costing less to produce than at another of their mines. The Government will not again tolerate the improvidence of the old days, and surely what they will not tolerate in others they themselves will not be guilty of. One of the stock cries of those who cry for cheaper coal is that it retards industries. There is one thing these have to explain, and it is this: Coal is higher in price to-day than at any previous time within the past fifty years, and yet industries are more prosperous than ever. Between the years 1878 and 1895, coal was dirt cheap. How fared it with industrial development in these years? It was all but stagnant. The item "notive power" is no doubt an important one, but it is quite insignificant as compared with "management." We must now have the best management, irrespective of cost; it was not always so, and just because it was otherwise was there so slow progress. The *Labor Gazette* gives the average wage of Canadian miners as $513 per annum. The average number of tons raised per person employed is 300. Some of the readers of THE CANADIAN MINING JOURNAL may be able to figure out how much profit a Manitoba mine owner will have if he sells coal at a dollar seventy-five.

Notices were posted at the shaft houses of Le Roi and Le Roi No. 2 mines on June 15th, informing the employes that on July 1st the following advances in wages would take effect:—Machine men, from $3.50 to $4 per day; muckers, from $3 to $3.25; shaft men, from $4 to $4.50; timbermen, $3.50 to $4.

GENERAL MINING NEWS

ALBERTA.

As a result of the fire which destroyed the equipment of the Walters' coal mine near Strathcona, six men lost their lives and fifty men are thrown out of employment.

QUEBEC.

Discoveries of molybdenite, graphite and copper are reported from the Gatineau district near the height of land. The claims registered in Quebec are located in two islands in Lake Kabingo.

ALASKA.

Junian.—On June 4th Judge Wickersham handed down a most important mining decision, which confirmed the right to the waters of any mining stream by appropriation, as against the rights of riparian land owners. This will have the effect of protecting mining companies against extortion by jumpers. The finding was made in the suit of Thorndyke versus the Alaskan Perseverance Mining Company and, applied to ditch companies throughout Alaska, will affect investments aggregating about $8,000,000.

NOVA SCOTIA.

GLACE BAY.

Construction work is being pushed by the Dominion Coal Company at Reserve. The screening plant, which will cost about $15,000, will be run by a 75 horse-power motor taking current at 500 volts. The new bankhead is about 250 feet in length. The trestle work to the east slope is 900 feet long, to the French slope 80 feet. Coal is hoisted from the pit by endless haulage. Chain haulage conveys it to the top of the bank.

GENERAL.

The Torbrook iron mines, which were recently shut down for a short time, have resumed work. The railway extension from the Wheelock shaft to the Martin property is almost completed. Many miners have left Torbrook for Cobalt.

It is stated that Mr. Hiram Donkin, of the Dominion Coal Company, is to be appointed Deputy Commissioner of Mines and Public Works.

President Richards, of the New England Gas & Coke Company of Boston, has announced that the company intends to go into the wholesale coal business and will bring to that port about 1,500,000 tons of Nova Scotia coal per year.

ONTARIO.

COBALT.

On June 14th seven miners were overcome by dynamite gas at the Cobalt Central.

The Nancy Helen Mine has installed a 12-drill compressor, driven by a gasoline engine.

A 10-drill compound air and steam compressor has been ordered by the Nipissing Company.

From No. 6 shaft on the Cobalt Lake Company's aeras a good showing of silver leaf is being taken.

The new vein cut by the Nipissing Company is an extension of the Trethewey Company's vein and is about six inches in width.

The Coniagas Mine is still the largest shipper. When the concentrator is completed her shipments will probably be increased by fifty per cent.

The 13-drill compound air and steam compressor ordered by the Cobalt Lake Mining Company arrived at Cobalt on June 8th. It has now been installed.

Superintendent Drummond, of the Nipissing, reports that $1,058,000 worth of ore has been blocked out. The mine is shipping at the rate of $100,000 per month.

North of Latchford forest fires, commencing about June 17th, raged for several days. Many prospectors lost their camp equipments. It is reported also that several lives were lost.

During the week ending June 8th, eighteen cars of ore were shipped from Cobalt. This makes a total for the year of 4,336 tons of silver-bearing ore. Last year's total shipments amounted to only 5,666 tons. The comparison is encouraging.

A good strike is reported on the Silver Leaf close to the Lawson porperty line. The vein is eight inches wide. It shows calcite, cobalt bloom, and native silver. The strike of the vein is diagonally across the property. Only for a short distance has it been stripped.

On the Right of Way property the main shaft is down over sixty feet. At the 75-foot level a cross-cut will be driven to the vein. Four cars have been shipped already, not including the ore taken out by La Rose people and afterwards awarded to the Right of Way. Superintendent Houston is pushing construction of ore house and shaft houses as rapidly as possible.

During the week ending June 8th the following shipments were made:—Coniagas, esven cars, 441,780 pounds; O'Brien, one car, 64,520 pounds; Nipissing, three cars, 196,630 pounds; Drummond, 44,090 pounds; Kerr Lake, two cars, 94,000 pounds; Trethewey, 61,000 pounds; Silver Queen, two cars, 124,580 pounds; Foster, one car, 40,000 pounds. Total, 1,066,900 pounds, making a record for a week's shipments.

Larder Lake.

The Dr. Redick Larder Lake Gold Mining Company has purchased the stamp mill, crushers, rolls, etc., formerly used by the Ottawa Gold Milling & Mining Company at their custom reduction works at Keewatin, Ont. The plant has been idle for about six years. The machinery is now being shipped to Larder Lake.

Port Arthur.

A New York party visited and inspected the West End Silver Mine on June 20th.

The Shakespeare Gold Mine, near Webbwood, Ont., is to be operated by power developed from the Birch Creek Falls.

The Government diamond drill has been sent to Eagle Lake, west of Port Arthur, to prospect a gold property owned by J. E. Stanton.

At the old West End Silver Mine Captain Pritchard is superintending the mining. A considerable amount of ore has already been stacked.

A discovery of zinc blende is reported from the Upper Wahnapitae. It occurs in limestone and is said to carry a few ounces of silver per ton.

The shaft of the Massey Mine has been pumped out and the levels are being cleaned. Mining will be resumed under the direction of Mr. Jas. Errington.

The Beaver Mine is being unwatered, and the Rabbit Mine will also be put in commission soon. The Silver Mines Consolidated Company is the prime mover in these activities.

Surveys are being conducted for a proposed new railway to connect the Helen Mine with the C. P. R. at Thessalon. A new smetler is to be erected at Thessalon, and 400 tons of ore per day will be shipped from the Helen.

BRITISH COLUMBIA.

At the Trail and Northport smelters fuel is arriving much more freely.

Development is progressing on the 350, 400 and 450 foot levels of the Iron Mask.

At Le Roi Mine the connection between the shaft and the winze on the 1,650 foot level has been completed.

A former foreman of the Granby, Mr. J. A. Miller, has been appointed superintendent of the California-Giant properties.

On June 23rd an explosion at the Crow's Nest Pass Company's No. 6 prospect, Coal Creek, near Fernie, B.C., resulted in the death of two men.

The Canadian-American Mining Company of Bellingham, Wash., is to begin working the Lorne Creek Placers at Lorne Creek, 100 miles up the Skeena River.

The Marble Bay miners' strike has been settled. The trouble arose from a misunderstanding on both sides, and the men have returned to work at their former wages and hours.

On the west coast of Vancouver Island, at Sidney Inlet, a copper property, owned by E. Dewdney, of Victoria, is to be exploited by Eastern capital. It is well situated as regards water shipment.

The Nest Egg Mine, Rossland, has been leased by Edward Webb from the British Columbia Land & Development Agency, Limited, of London, England. The mine has not been worked since 1897. A sixty foot shaft and a few short drifts constitute the present developments.

It has been decided that in future a permanent summer mining class of the Mining Department of McGill University will be held in British Columbia. The Hon. H. E. Young, Minister of Education, is co-operating with Professor J. Bonsall Porter in making all necessary arrangements.

Thirty-five miles from Jedway, Queen Charlotte, a large deposit of copper ore is reported to have been discovered. The property is undr option at a figure of $400,000. The deposit is 100 feet wide and has been traced for 4,000 feet. It is said to carry 4 per cent. copper and some gold values. Four thousand tons of copper ore are awaiting shipment at Ikeda mine and was taken from Ikeda Mountain. The remainder came from the MacMillan mine. The ore will be shipped to the Ladysmith smelter.

The British Columbia Government has sent Mr. Herbert Carmichael, accompanied by two third-year McGill men, Messrs. Carruthers and Meyerstein, to the Alberni district on the west coast. A steam launch is to be taken up the coast, transported twelve miles by wagon road to Great Central Lake and used there during the summer. While Mr. Carmichael will perform a considerable amount of topographical work, he will also pay especial attention to the mining posibilities of the Alberni district. The Government will issue bulletins from time to time, reporting the progress of this work.

Mr. Thomas Kiddie, manager of the Brown-Alaska smelter, Hadley, Prince of Wales Island, was in Victoria early in June making arrangements to overcome the coal and coke shortage which has been handicapping the operation of his enterprise. The recent fire in the Comox coal mine caused a stoppage of shipments and had an immediate effect upon the smelter. Mr. Kiddie expressed the hope that he would be able to secure regular shipments of fuel before leaving for Hadley again. In speaking of the copper ores treated at Hadley, he said that the Maple Bay ores, which constitute their principal supply, are very silicious. To obviate the necessity of using barren fluxes, basic ores from nearby deposits are about to be secured. Mr. Kiddie has ordered the material for an installation of his hot blast system.

YUKON.

Until new discoveries shall have been made it may now be premised that the day of the individual miner in the Yukon is over, and operations in future will be confined to exploitations on a large scale by such powerful concerns as the Guggenheim Exploration Company, who last year secured the control of large areas of ground on Banaza, Hunker, Eldorado and other creeks which erstwhile yielded so fabulously. This company is meanwhile sending in large quantities of supplies and materials for the

commencement of extensive dredging and hydraulicking operations; and no less than a million feet of timber to be used for dredge construction purposes was recently purchased in British Columbia and is now being shipped to Dawson via Skagway. The pipes to be installed in connection with the company's water system are also of usual size, being 70 feet in length and 4 feet in diameter.

MINING NEWS OF THE WORLD

AUSTRALIA.

Queensland's gold yield for the first quarter of the present year represents a value of £464,960, or a slight decrease compared with last year's returns for the corresponding period.

Australia's gold output for the first four months of 1907 shows a falling off of over a hundred thousand ounces. The production, nevertheless, reached the respectable total of 1,048,647 ounces.

At Broken Hill the Zinc Corporation are experimenting with the granulation process, one unit having turned out a satisfactory concentrate on a limited scale. Six Ullrich magnetic separators have been installed and a trial run proved successful.

A report has been issued by the Commission appointed by the West Australian Government to inquire into allegations of gold stealing in that State. The report contains several pages of recommendations, including a stricter supervision of the gold-selling business, while the establishment of searching rooms at the mines is advised.

One company that has actually accomplished more than the prospectus promised is the Great Cobar, which was formed in May of last year. Since September last the mine has produced 3,217 tons of copper, 7,595 ounces of gold and 47,300 ounces of silver. As a result of development work, the ore reserves have been considerably increased, and now represent eight years' supply at the present rate of production. The company's consulting engineer is Mr. J. D. Kendall, of London, well known to many of our readers in the West.

UNITED STATES.

Applications have been made for patents covering asbestos areas in Placer County, California. On one property some development work has been prosecuted and asbestos of good quality exposed.

At Butte, the shaft on the High Ore, one of the Anaconda group, has been sunk to the great depth of 2,800 feet, where an immense station is to be cut. At the Boston and Montana production is being made at the rate of 3,300 tons a day.

The Calumet and Hecla mine, Houghton, Michigan, is being equipped with a large recrushing mill to treat the tailings from the other mills and preparation of the present stamp sands. The plant includes 48 Chilean mills and Wilfley tables.

The verdict in the case of the Stratton Independence Company vs. the Portland Gold Mining Company, in which the latter originally sued for damages on the grounds of trespass and the extraction of a large quantity of valuable ore, having gone to the dependants, the plaintiff company has given notice of appeal. The sum involved is in the neighborhood of half a million dollars.

GREAT BRITAIN.

It is proposed to establish at South Kensington an Imperial College of Science and Technology. Specialized courses in mining and metallurgy will form one of the departments of the work of the Imperial College, and provision will be made therefor in the charter.

In the course of a speech recently in the House of Commons, the Prince, referring to the regulation of the hours of labor in mines, said that the Report of the Departmental Committee on the subject showed how absolutely necessary it was for careful enquiry before introducing legislation of a radical nature. In the light of the report it was expected that a Bill would be shortly prepared, and he was not without hope that it might pass this session. A more likely contingency was that it would be introduced, criticized and made the subject of arrangement, consultation, suggestion, and perhaps compromise during the autumn, which would enable the Bill to be easily carried in the session that was to come.

SOUTH AFRICA.

The gold output of Rhodesia for April was 49,772 ounces.

The Transvaal diamond production for March aggregated 159,303.76 carats, valued at £239,610.

A tax of 7 per cent. on the profits of diamond mines exesting before the ordinance of 1904 is to be imposed in Orangia.

A general strike has been declared by the miners on the Rand, and it was considered necessary to call out cavalry to put a stop to a demonstration.

At the recent session of the Legislative Council of Rhodesia, a resolution was introduced declaring that the time ha deome for the British South Africa Company to be relieve dof its admanistrative responsibilities, and that administration be entrusted to a representative Government. It was finally decided to approach the Imperial authorities to secure a change in this regard. There is no doubt that the mining industry of Rhodesia would be greatly benefited by the change suggested.

NEW COMPANIES

A. W. Jacobs Mines, Ottawa, $1,500,000.

Tilbury Gas Company, of Chatham, $40,000.

Cobalt & James Mines, Toronto, $1,000,000.

Canadian Bessemer Ores, Toronto, $250,000.

Lansing Cobalt Mining Company, Windsor, $400,000.

Searchlight Larder Lake Mines, New Liskeard, $3,000,000.

Coleman-Bucke Silver Mining Company, Ottawa, $1,000,000.

Prospect Developing & Mining Company, Cobalt, $1,000,000.

The Nipissing Gold Estates, Limited, Cobalt; capital, $4,000,000.

Cobalt Confederated Mines, Limited, Cobalt; capital, $3,000,000; shares, $1 each.

Buffalo Larder Gold Mines, Limited, Toronto; capital, $2,000,000; shares, $1 each.

Red Jack Mining Company, Limited, Midland, Ont.; capital, $500,000; shares, $1 each.

Montreal Gold & Silver Mining Company, Limited, Cobalt, Ont.; capital, $10,000; shares, $1 each.

New Liskeard Lands, Timber & Mines Company, a colonization and land enterprise, $300,000.

COMPANY NOTES

The annual meeting of the Dominion Iron & Steel Company has been set for July 5th. The directors passed on the report at the meeting to-day.

Under the reorganization of the Canada Corundum Company, recently completed, Mr. C. S. Wilcox becomes president, Mr. C. D. Warren chairman of the Board of Directors, and Mr. D. A. Brebner remains secretary-treasurer. Mr. H. E. T. Haultain, who has been in charge of the production end of the business for the past twenty-one months, has been appointed general manager and has moved the head office of the company from Toronto to Craigmont.

Catalogues and Other Publications Received

A special catalogue, with a strikingly beautiful cover, is issued by the Canadian Westinghouse Company, Hamilton, Ontario. Its subjects are electric fans and small power motors.

The American Spiral Pipe Works, P. O. Box 485, Chicago, Illinois, in a neat and attractive catalogue, illustrate their forged and rolled steel pipe flanges. One of their specialties is spiral riveted pipe for water supply lines.

"Mine and Quarry" for May, 1907. This very readable periodical, published by the Sullivan Machinery Company, Chicago, contains articles illustrating the use of their various drills, coal mining machines, etc. The May number gives a description of "Mineral Prospecting at Cobalt."

"Morton's Hand Book of the Cobalt District," published by Cobalt Mining Information Bureau, Limited ,1223-4 Traders Bank Building, Toronto, Canada. This convenient little hand book contains a geological sketch of Cobalt and a list of "passed" claims in Coleman, Bucke and Lorrain Townships. In addition, it gives a list of mining companies operating in Cobalt and important extracts from the Ontario Mines Act, 1906.

Under the title "Paroid Proofs," F. W. Bird & Son, makers of Paroid Roofing, issue a booklet in which are displayed photographs of buildings in various places of this continent, where "Paroid" is used. "Paroid" is a fireproof, weather-resisting roofing material. It is particularly adapted to the requirements of mine owners. The Canadian factories of F. W. Bird & Son are situated in Hamilton, Ont., and in Winnipeg, Man.

Two interesting photographs have been received from Messrs. Peacock Brothers, engineers, Canada Life Building, Montreal. The first is a group of views of the construction of the "King Edward VII." bridge, Newcastle-on-Tyne, built for the Northeastern Railway. The whole of the steel castings, including roller and fixed bearings, for the bridge are of Hadfield's best cast steel. The second photograph shows Hadfield's foundation plates with pivots and rollers. Messrs. Peacock Brothers are the Canadian agents.

A volume of superb photogravures has been received from the Brown Hoisting Machinery Company, Frick Building, Pittsburg, Pa. Many photographs of their installations of patent automatic hoisting and conveying appliances in America and Europe are reproduced. The "Brownhoist" has proved a potent factor in decreasing freight rates on the Great Lakes. A smaller volume shows the standard designs of the "Brownhoist" cranes. To these cranes is attached the "Weston Patent" safety lowering device.

STATISTICS AND RETURNS

Nelson, B.C., June 15.—The following are the ore shipments and smelter receipt sin Southeastern British Columbia districts for the past week and year to date in tons. Shipments:—

	Week.	Year.
Boundary	27,825	434,251
Rossland	5,898	119,919
East of Columbia River	2,763	56,005
Total	36,486	610,175

Smelter Recepts—

	Week.	Year.
Grand Forks	14,767	236,611
Grenwood	9,067	121,353
Boundary Falls	4,021	64,534
Trail	3,686	98,363
Nelson	353	8,551
Northport	2,846	44,255
Marysville	600	14,400
Total	35,340	588,067

British Columbia re shipments for week ending June 8th:—

Boundary Shipments

Mine.	Week.	Year.
Granby	12,621	220,553
Mother Lode	4,400	88,617
Oro Denoro	240	1,578
Brooklyn	480	25,595
Idaho	640	1,836
Rawhide	1,280	22,036
Sunset	840	9,100
Providence	60	667
Mountain Rose	70	2,012
Other mines	.....	34,432
Total	20,631	406,426

Rossland Shipments—

Mine.	Week.	Year.
Centre Star	2,630	38,772
Le Roi	3,369	58,177
Le Roi No. 2	583	8,980
White Bear	78	1,172
White Bear, milled	350	2,550
Other mines	.....	3,370
Total	7,010	114,021

Kootenay-Slocan Shipments—

Mine.	Week.	Year.
Sullivan	600	13,800
La Plata, milled	425	9,775
Second Relief, milled	145	3,055
Queen, milled	185	4,255
Eva, milled	230	1,150
Whitewater, milled	300	1,050
Queen Victoria	136	1,994
Silver King	100	1,010
La Plata	88	1,510
St. Eugene	230	6,510
Hunter V.	109	2,188
Slocan Sovereign	47	69
Ottawa	22	125
Whitewater Deep	102	360
Other mines	.....	6,391
Total	2,719	53,242

The total shipments from the mines in the above districts for the past week were 30,360 tons, and for the year to date $573,689 tons.

The output of the Crow's Nest Pass collieries for the week ending June 21st was 19,371 tons. The daily average was 3,228 tons. For the corresponding week last year the output was 20,800 tons.

The output of the Crow's Nest Pass Coal Company's collieries for the week ending June 14th was 23,300 tons; daily average, 3,885 tons. The output for the week ending June 15th last year was 20,790 tons, a daily average of 3,465 tons.

During the month of May Le Roi Mine shipped to Northport 10,930 tons of ore, containing 2,495 ounces gold, 4,972 ounces silver, and 272,100 pounds copper. Estimated profit on this ore after all deductions, $17,500. Expended on development during the month, $13,000.

The following are the figures of German consumption of foreign copper for the months January to April, 1907:—Imports of copper, 39,059 tons; exports of copper, 2,834 tons; consumption of

copper, 36,225 tons; as against 38,804 tons during the same period in 1906.

Of this amount 31,103 tons were imported from the United States. Figures are compiled by L. Vogelstein & Company.

Cobalt ore statement for period June 16th to June 22nd, 1907:—

Trethewey Mine.—June 17th, 61,200.

Nipissing Mine.—June 17th, 60,000; June 19th, 40,160; June 21st, 59,840. Total weight, 160,000.

La ose Mine.—June 18th, 44,040; June 18th, 64,140; June 18th, 42,030; June 21st, 82,006; June 21st, 84,000. Total weight, 316,215.

Coniagas Mine.—June 17th, 67,410; June 17th, 62,000; June 18th, 62,000; June 19th, 62,000; June 20th, 62,000; June 20th, 58,450; June 21st, 62,000. Total weight, 435,860.

Buffalo Mine.—June 19th, 60,000; June 20th, 60,000; June 20th, 41,130; June 21st, 60,000. Total weight, 221,130.

Total weight for all mines, 1,194,406.

METAL, ORE AND MINERAL MARKET

Aluminium, No. 1 grade ingots—46 cents per lb.

Antimony—12 to 16 cents per lb.

Arsenic, white—7 1-2 to 7 3-4 cents per lb.

Barytes, crude—$11.25 to $14.50 per short ton.

Bismuth—$1.50 to $1.75 per lb.

Cadmium—$1.40 per lb.

Carbons, for drills—$78 to $85 per carat.

Carborundum, powdered—8 cents per lb.

Chronium, metal pure—80 cents per lb.

Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.

Corundum—7 to 7 1-2 cents per lb.

Feldspar, ground—$9.75 to $10 per short ton.

Flourspar, lump—$10 per short ton.

Graphite, domestic—$50 to $150 per short ton.

Gypsum, lump—$4.50 per long ton.

Infusorial earth, ground—$15 to $30 per ton.

Lead—5.75 cents per lb.

Manganese, pure metal—75 cents per lb.

Mica, ground—$80 per short ton.

Mica, scrap—$15 per short ton.

Molybdenum, pure—$1.70 per lb.

Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.

Nickel—45 to 50 cents per lb.

Platinum, ordinary metal—$27 per ounce.

Platinum, scrap—$20 to $21 per ounce.

Pyrite, 38 per cent. to 45 per cent. sulphur, lump, 10 to 11 1-4 cents per unit.

Quicksilver—$41 to $42 per 75 lb. flask.

Talc—$18 to $23.50 per ton.

Tungsten, pure metal—$1.25 per lb.

Tungsten ore, 60 per cent. pure—$400 per ton.

Tin—43 1-2 cents per lb.

Zinc Sheets—$8.60 per 100 lbs.

MARKET NOTES.

Spelter.—Busines is dull and prices have declined. New York, 6.40 to 6.45 cents per lb.; London, £24 10s. per long ton.

Lead.—Quiet market. Very little business being transacted. New York, 5.75 cents per lb.; London, £20 15s. for Spanish; £21 for English.

Northern pig iron No. 1 ranges from $26.50 to $27 for delivery within thirty days. Bessemer malleable, $26 to $26.50. Bessemer ore, old range, $5. Bessemer mesabi, $4.75. Non-Besesmer, old range, $4.25.

Tin.—Although the market has been quiet, foreign manipulation has caused an advance in the price of tin. This has been felt more decidedly in London than in New York. New York, 43 1-2 cents per lb.; London, £187 10s for spot.

The copper market is stagnant, and further reduction in price is expected. Lake copper, 23 3-4 to 24 1-2 cents per lb.; electrolytic, 22 1-4 to 22 3-4 cents per lb. London quotations on long ton of 2,240 lbs. for spot standard are £99, or 21.50 cents per lb.

Silver.—There have been strong movements in silver:—June 13th, 66 7-8 cents per ounce; June 14th, 66 3-4 cents per ounce; June 15th, 67 1-4 cents per ounce; June 17th, 67 1-8 cents per ounce; June 18th, 67 1-2 cents per ounce; June 19th, 67 3-8 cents per ounce. Mexican dollars, 52 1-8 cents. British sovereigns, $4.85. Sterling exchange, $4.8735.

NEW DIVIDENDS.

The Granby Consolidated Mining, Smelting & Power Company, Limited, at the regular monthly meeting of its directors, held in New York on June 4th, declared a regular quarterly dividend of 2 per cent. and an extraordinary dividend of 1 per cent., payable June 29th out of the net earnings of the company. This is the seventh dividend of the Granby Company. It amounts to $405,000. The shares are now paying a regular 8 per cent. dividend, with extra 1 per cent. quarterly dividends bringing up payments to 12 per cent. per annum. The dividends to date are as follows:—No. 1, December, 1903, $133,630; No. 2, January, 1906, $405,000; No. 3, May, 1906, $405,000; No. 4, September, 1906, $405,000; No. 5, December, 1906, $405,000; No. 6, March, 1907, $405,000; No. 7, June, 1907, $405,000. Total, $2,563,630.

At a general meeting of the shareholders of the Richard III. Mine, held on June 7th, in Victoria, B.C., a dividend of 2 1-2 per cent. was declared, payable on and after June 15th. It was announced that after payment of this dividend a reserve of $10,000 would remain for carrying on development work. Ore from this mine is being treated at the Tyee smelter, Ladysmith.

The regular quarterly dividend of 3 per cent., or 15 cents per share, has been declared by the directors of the Nipissing Mines Company. No action was taken in regard to the erection of a smelter. No figures were given out, but it is understood that the financial report was satisfactory. The company is said to have enough cash to pay the next two quarterly dividends.

NOVA SCOTIA STEEL DIVIDENDS.

The Nova Scotia Steel & Coal Company declared dividends of 1 1-2 per cent. on common, and 2 per cent. on preferred, payable July 15th, to holders of record of June 30th.

The Coniagas Mine has declared a dividend of 2 per cent., payable on July 1st.

Crow's Nest Pass Coal has declared the regular quarterly dividend of 2 1-2 per cent., payable July 1st.

The directors of the Dominion Coal Company met in the first week of June to declare the quarterly dividend on Dominion Coal common stock. The dividend is payable in July.

At a meeting of the directors of the Kerr Lake Mining Company it was decided to pay the regular quarterly dividend, No. 7, of 2 per cent. and 1 per cent. bonus, on July 1st to all shareholders on record on June 22nd, 1907.

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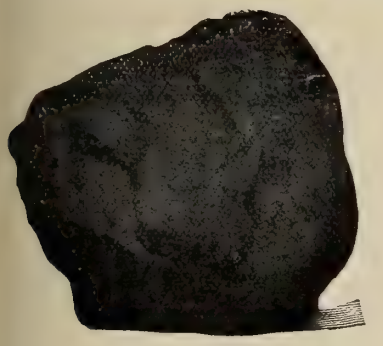
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Toronto, Canada.

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All mines belong to the Government of the Province on all unsold lands and on all those sold since the 24th July, 1880, but gold and silver are always reserved whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such license the first right to purchase the mines. In the case of lands where the surface only is sold, the owner of the surface may be expropriated if he refuses an amicable settlement

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

On lands situate more than 20 miles from a railway in operation, $10.00 per acre, and on lands situate less than 20 miles from such a railway, $20.00 per acre;

Superficial products and building materials are sold $2 and $4 an acre according to the distance from rail road.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions: The full price must be paid in cash; specimens must be produced and accompanied by an affidavit; a survey at the cost of the applicant must be made on unsurveyed lands; work must be bona fide begun within two years and $500.00 spent for each 100 acre concession.

MINING LICENSES, giving the right to work the mine and dispose of its products, are granted on payment of a fee of $10.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts

The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the Government

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the new Transcontinental Railway will run.

The government has made special arrangements with MR. MILTON L. HERSEY, 171 St. James St. Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines, at Quebec, will give all the information asked for in connection with the mines of the province, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

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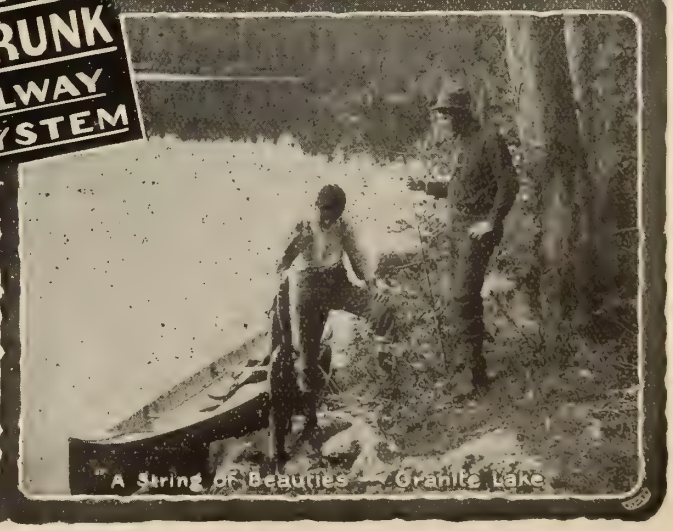
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Our Spring Catato6ue was ready for mailing on the first of March. Send us your name and address and we will gladly mail you one and put you on the list for all subsequent catalogues. Our Spring Catalogue for 1907 is a complete price list of nearly every article of merchandise to be found in the store. A veritable hand-book of information for housekeepers and a thing of interest for everybody who has buying to do and money to spend. Write for it now so as we can have your name on the list in time for the special Summer Catalogues.

Here are "Specials" for mining men, prospectors, and all readers of this paper who have heavy work to do or rough journeys to make.

Clothing "Specials"

to readers of this paper

1100 strong, serviceable English, Canadian and Scotch tweed suits, also English corduroy, suitable for business or town wear as well as for men who need strong clothes. Weights are medium and heavy. Regular prices run from $10.00 to $14.00. Sizes 35 to 44. We offer these suits to readers of this paper for **$7.95**

150 Rubberized Waterproof Rain Coats, made of English covert cloth, grey and fawn, seams sewn and taped, strong, neat, comfortable, nothing sticky about them. Sizes, from 36 to 44. Regular $7.50, $8 and $8.50. Special to readers of this paper **$5.00**

1,000 pairs Moleskin Working Trousers, grey and black, strongest trousers made. Sizes, 32 to 42 inch waist Special to readers of this paper ..... **.90**

500 Working Jackets, of striped moleskin and duck in khaki, brown and slate. Regularly $2.00 apiece. Special to readers of this paper **$1.25**

Underwear, Shirts, etc.

Men's Heavy Scotch Wool and Fleece Lined Underwear, guaranteed unshrinkable, non-irritating, overlocked seams, elastic ribbed cuffs and ankles. Sizes 34 to 46 Regular value, 90c. garment, per garment ..... **.69**

500 Men's Heavy Khaki Duck Mining Shirts, collars, pockets, have patent fasteners, large roomy shirts, wind and rain proof. Sizes, 14 to 17½. Special ..... **.89**

Men's English Cardigan Jackets and Golf Coats, three pockets, guaranteed all worsted, fast color. Sizes, small, medium and large. Regular value $4.00 and $5.00. Each **$2.98**

Men's Heavy Elastic Web Suspenders, strongly sewn, made with unbreakable cast off leather ends, Police-Firemen style. Our price 50c. Each ..... **.39**

Men's Heavy Tweed Shirts with collar and pocket, generously made, double stitched throughout, also a few heavy Mackinaws and black Drills in the lot. Sizes 14 to 18. Regular value, $1.25, $1.50, $1.75, $2 00. Each.. **.89**

THE ROBERT **SIMPSON** COMPANY, LIMITED | **Toronto** Canada

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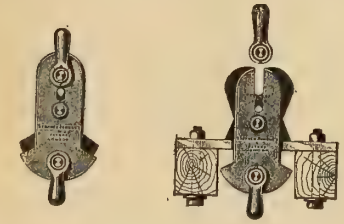
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Board of Trade Building, Montreal

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Ile Perrot, near Vaudreuil, P. Q.



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STEPHEN HUMBLE'S
IMPROVED PATENT SAFETY
DETACHING HOOKS
have saved thousands of lives all over the world by preventing overwinding. Full particulars on application.



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FOR WINDING ENGINES
ALSO
COLUMN INDICATOR
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THE CANADIAN MINING JOURNAL

I. No. 9 New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 11



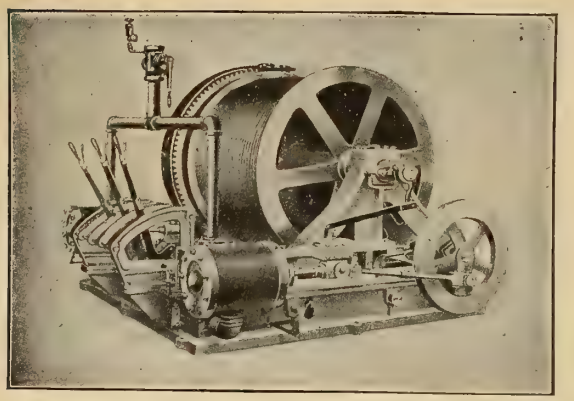
Pages of Special Interest

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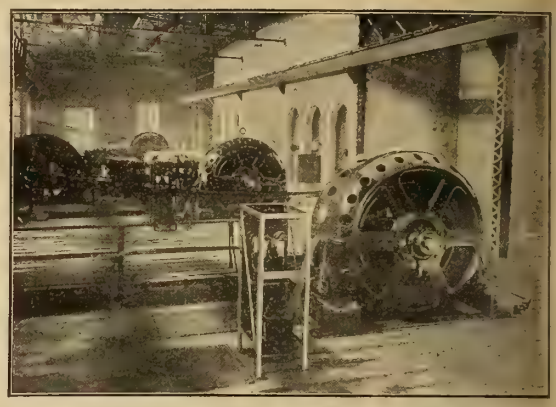
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BUYERS AND SELLERS OF METALS XXII and XXIII

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Purchasers may avoid the delays inevitable in dealing with half-a-dozen companies for different portions of their equipment and obtain better value by purchasing their entire equipment from One Company.



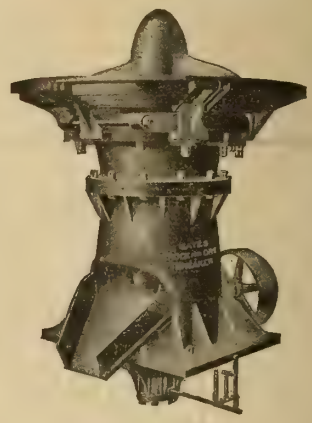
The "Lidgerwood" combined friction drum and brake and reversible link motion hoisting engine is the most economical yet made for mine hoisting.



Three of our 600 h.p. Induction Motors driving blowing engines at the Cana n Copper Co., Copper Cliff. This type of motor is specially adapted for all mining operations.



This is a view of three of our Ingersoll steam drills engaged in rock excavation



Gates "K" Rock and Ore Breaker will break more per horse power tha other ever built.

Air Compressors	Frue Vanners	Lixiviation Plants	Rock Drills
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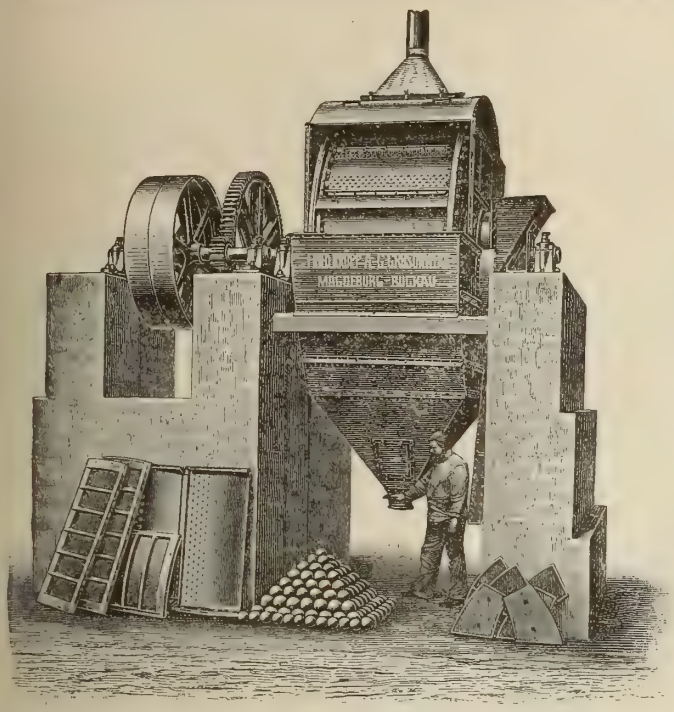
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SPECIALTY

BALL MILLS

FOR DRY AND WET CRUSHING

Advantages:

Continuous working.

Immediate automatic discharge of the product as soon as the desired degree of fineness has been attained.

EXCEEDINGLY UNIFORM PRODUCT.

Hardest ores ground to any degree of fineness.

Minimum wear and tear.

Easy access to the interior of the large grinding drum.

Require little attention.

MODERATE POWER, WITH HIGH CAPACITY

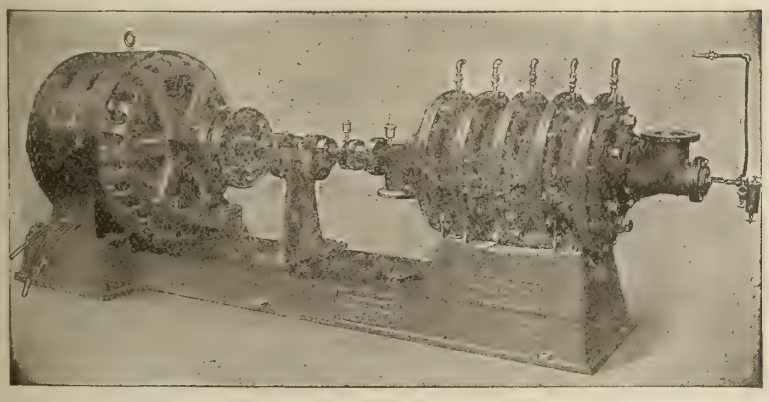
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Westinghouse Induction Motor Driving Byron-Jackson 5-Stage Centrifugal Pump.

Where motor-driven pumps are used the heat always attending steam pipes and engine-driven pumps, the danger and expense of bursting or leaky pipes, the annoyance of steam traps, separators, etc., is eliminated. The space required for electric service wires is negligible compared with that required for piping, and in case of accident, any mechanical injury can be easily and quickly repaired.

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NEW ORE CRUSHER AT WORK

WILL CRUSH 1,500 TONS OF KNOB HILL ORE EVERY 10 HOURS.

OPERATED BY ELECTRICITY SUPPLIED BY CASCADE POWER CO.

Phoenix, Jan. 23.—(Special to The Daily News.) —This week all the electric wire connections having been made, the new ore crusher, ordered last May by the Granby company, was started in operation. It has been ready for some time and only awaited the coming of the electric current from Cascade.

The initial run of the huge machine was eminently satisfactory to superintendent Williams, who will have it operated 10 hours daily, in which time it will crush 1,500 tons of Knob Hill ore. Later another machine of the same type will probably be installed at the Old Ironsides' ore bins.

The crusher is of the Blake-Farrell type and is the largest machine of its kind in Canada. The chilled steel jaws will take a piece of rock 36x42 inches in size, more than a cubic yard, and is fitted with swing jaw and pitman. It was furnished by the Jenckes Machine company, of Sherbrooke, Que. The freight on one of the several cars in the shipment was over $2,000.

To operate the crusher a 100 horse power electric motor was secured from the Canadian General Electric company.

BRADSTREET'S REPORT

Conditions During the Week.

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Largest Crusher in Canada

The newspaper clipping reproduced herewith refers to a 42" x 30" Crusher built by us for the Granby Smelter at Phoenix, B.C., being the first of four similar, counting one now under construction, built for this same company. The four Crushers have a total capacity of six thousand tons of rock every ten hours. They are the largest Crushers of the Jaw type in Canada.

WRITE FOR BULLETIN 602

THE

Jenckes Machine Co., Limited

Sales Office :		Executive Office :	Plants :
St. Catharines	Halifax	Sherbrooke, Que.	Sherbrooke, Que.
Rossland	Cobalt		St. Catharines, Ont.

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ALLAN, WHYTE & CO.

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Rutherglen, Glasgow, Scotland

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For Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.
Wire specially selected for own exclusive use.
We have made many records with our Winding, Haulage and Crane Ropes.

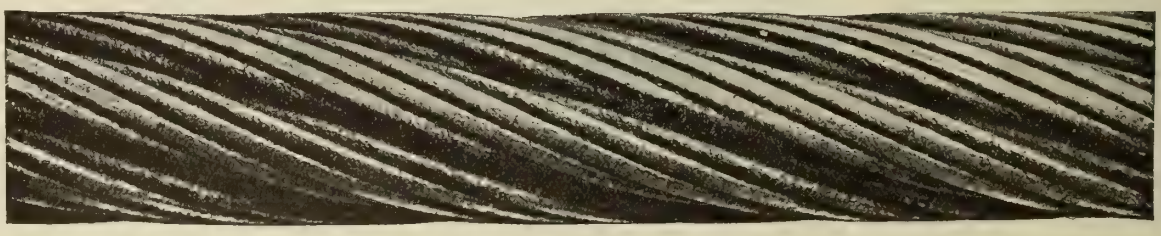


Illustration of **Winding Rope,** 240 fms. long x 3½ circ. Galvanized Special Improved Patent Steel. Compound Make, supplied to Kenneil Collieries, Bo'ness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

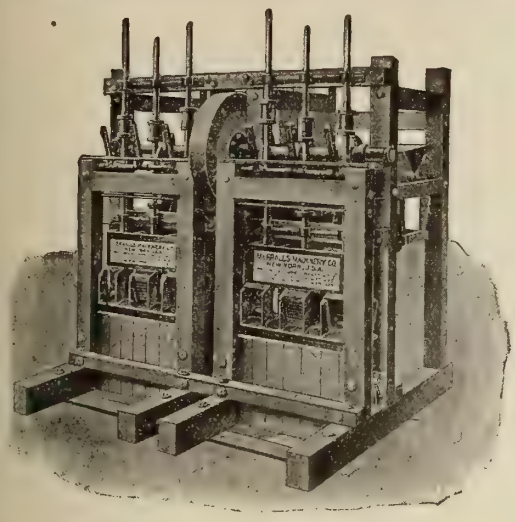
TELEGRAMS—"Ropery Rutherglen." A B C, A 1 and Lieber's Codes used.

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A SIX-STAMP BATTERY.

Each Stamp has:
Screens on all four sides;
Separate ore feeder for each stamp;
Separate water supply;
Its own compartment.

Each Stamp:
Will handle from 6 to 8 tons of ore per day of 24 hours, according to the hardness of the ore and the fineness of the crushing.

Save your money in installation and save your money in cost for Repairs and running expenses.

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Use Greening's Rope Grease for Lubrication

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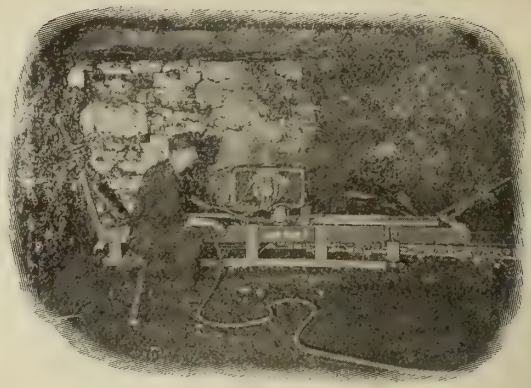
Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3/8" to 1/4" Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel,, Forging of all kinds, Bright Compressed Shafting 5/8" to 5" true to 2/1000 part of one inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand

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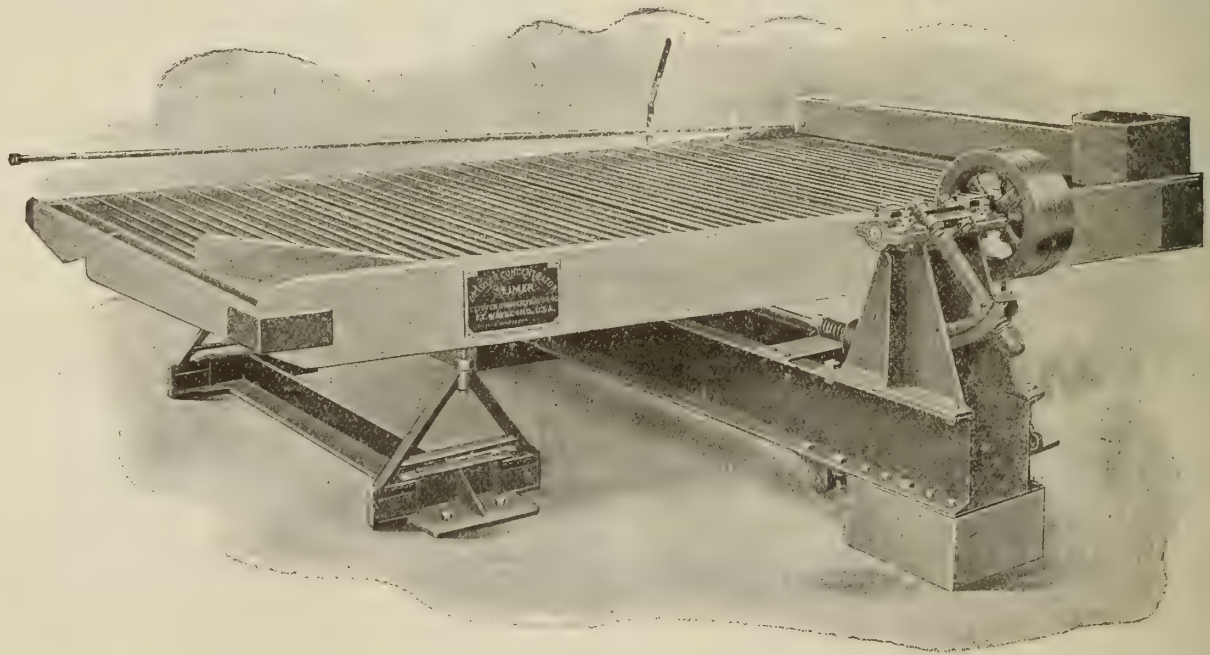
Judges say: "No argument seems necessary in this case."

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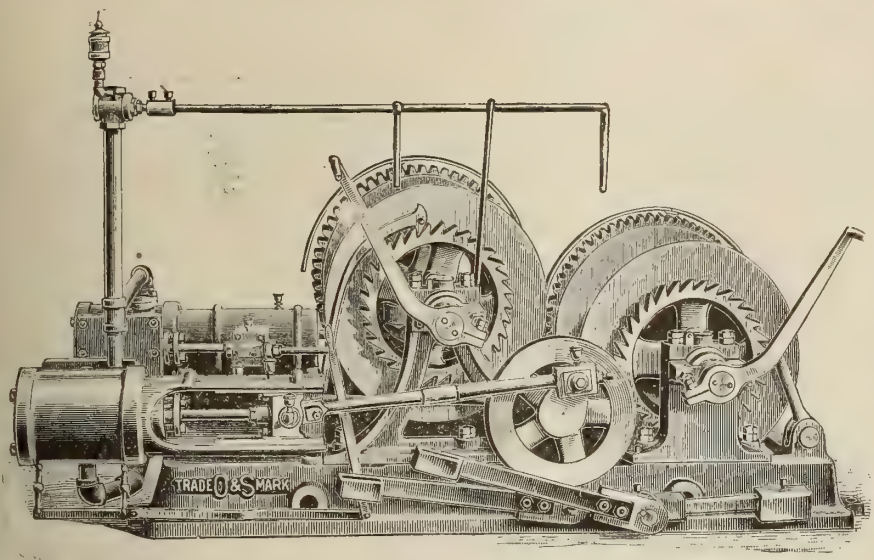
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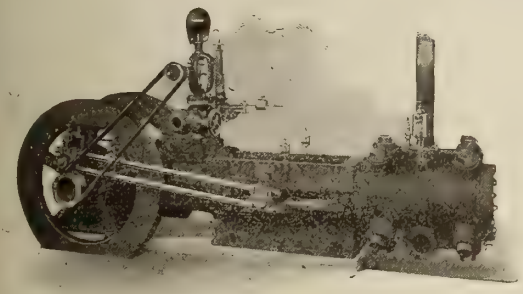
A. R. Williams Machinery Co., Limited

Head Office - Toronto

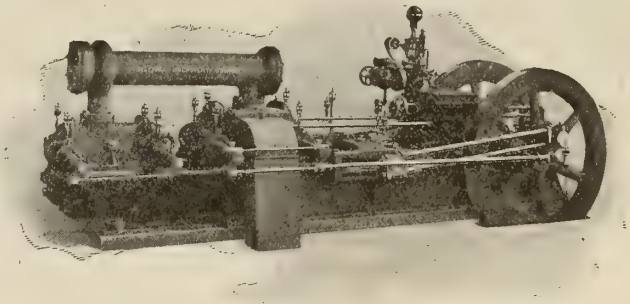
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Capacity 100 to 200 feet per minute. Simple Steam and Air Cylinners. Duplex and Corliss Compressors for any requirements. Specifications on request.



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Capacities 300 to 2500 feet per minute. Simple Steam and two-stage Air Cylinders, with inter-cooler and Corliss air inlet valves.
Catalogues 58-J

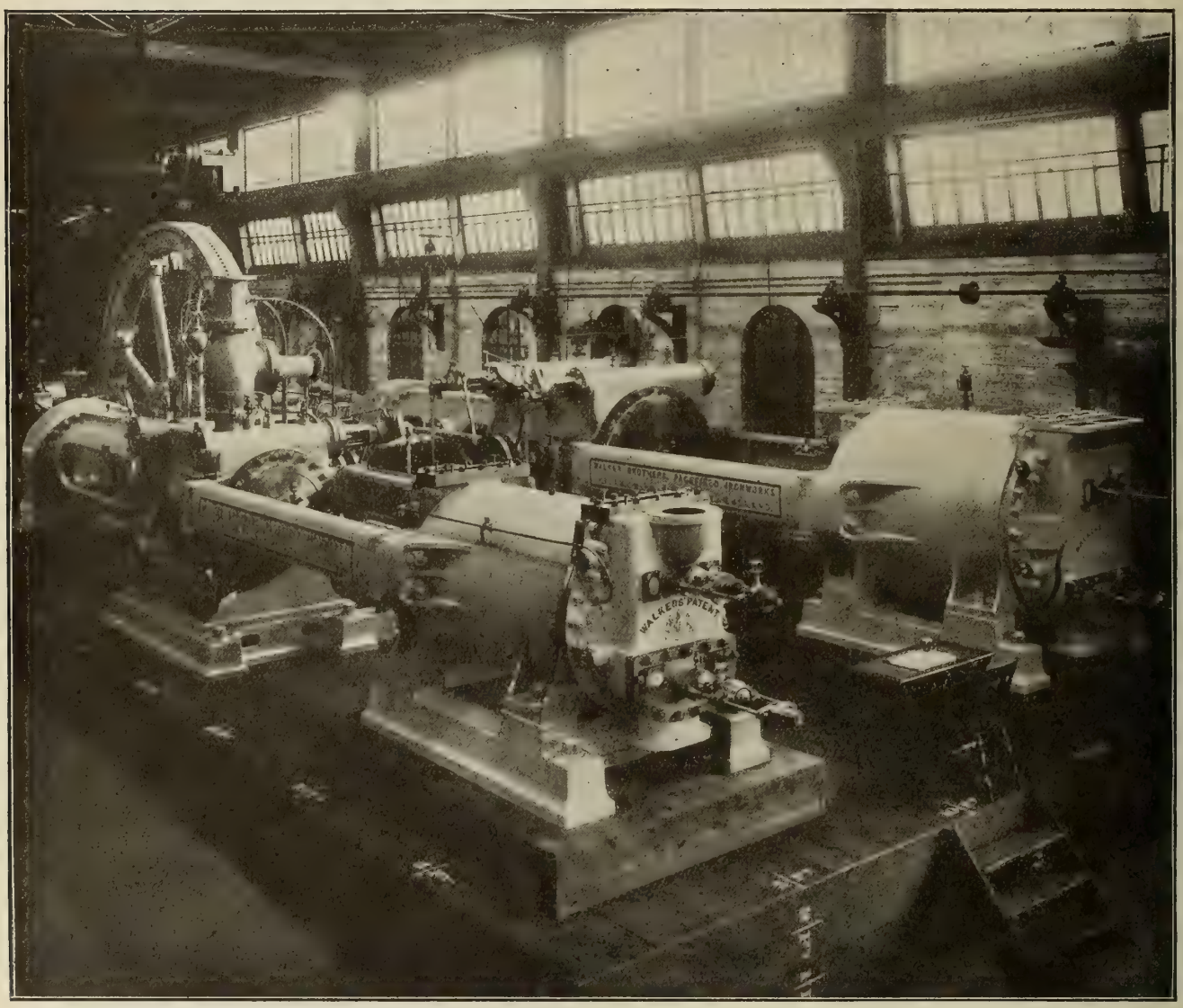
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SULLIVAN MACHINERY CO.

Claremont, N.H. New York Pittsburg Knoxville Railway Exchange El Paso San Francisco Salt Lake Rosslanb
St. Louis Joplin, Mo. Denver Butte CHICAGO, Ill. Paris, France Johannhsburg Spokane Mexico

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Wigan, England



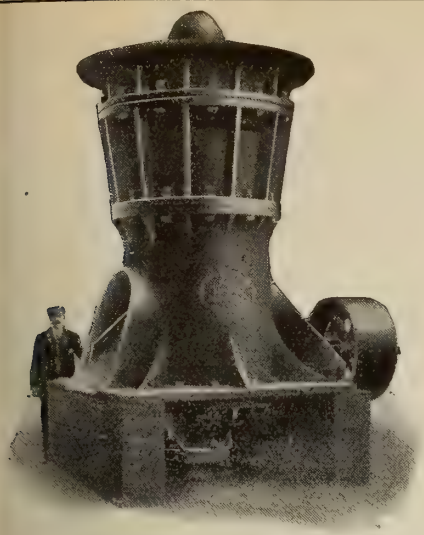
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are of WALKER BROTHERS (Wigan) LIMITED manufacture.

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is used for all the wearing parts. This steel is the supreme material for Tramway Track-work and parts of machinery subject to great abrasive strain.

Steel Castings for Collieries, Mines, etc.,

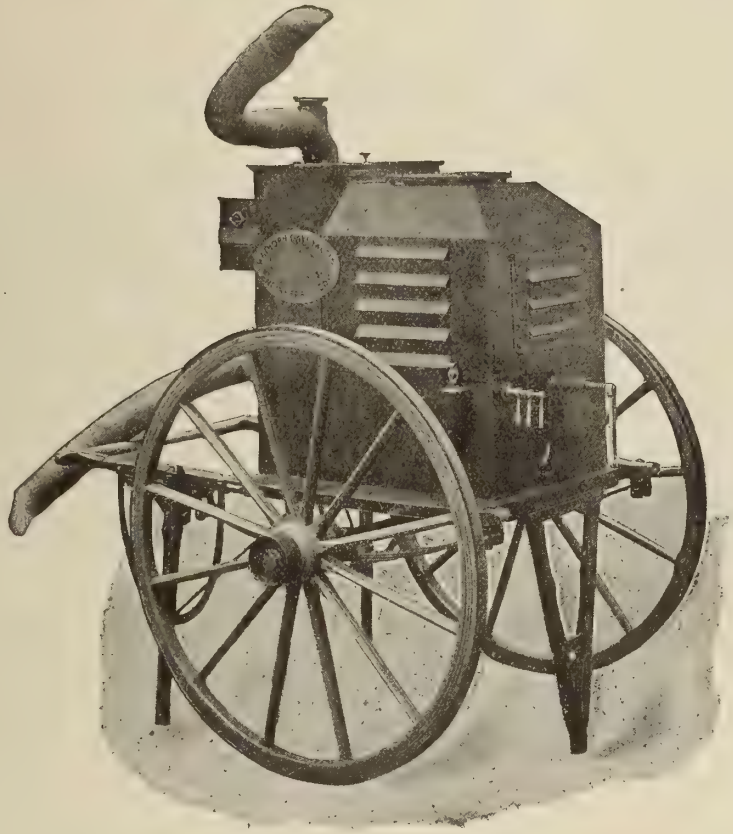
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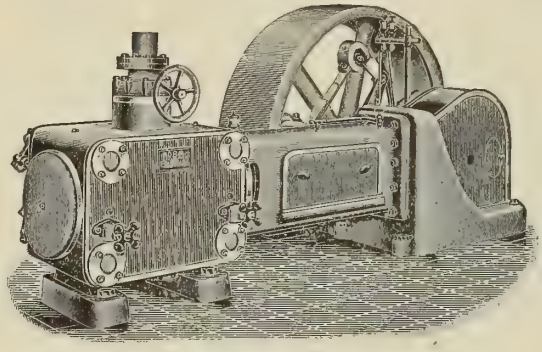
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CANADA LIFE BUILDING
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We design and contract for steam power plants and maintain an experienced and thoroughly practical engineering staff that is at the service of our customers.

Corliss Engines
High Speed Vertical Engines
Medium Speed Horizontal Engines
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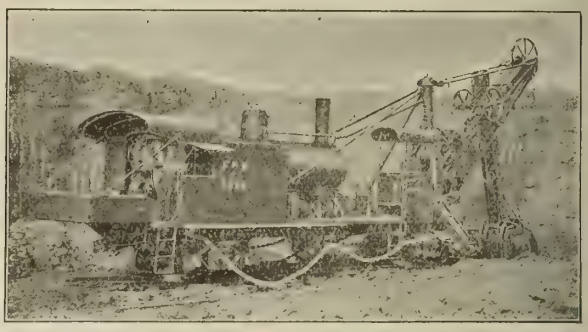
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Commends itself to users for its

SIMPLICITY OF DESIGN
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MANUFACTURED BY

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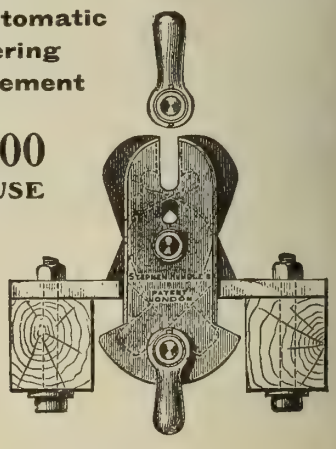
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With Automatic Lowering Arrangement

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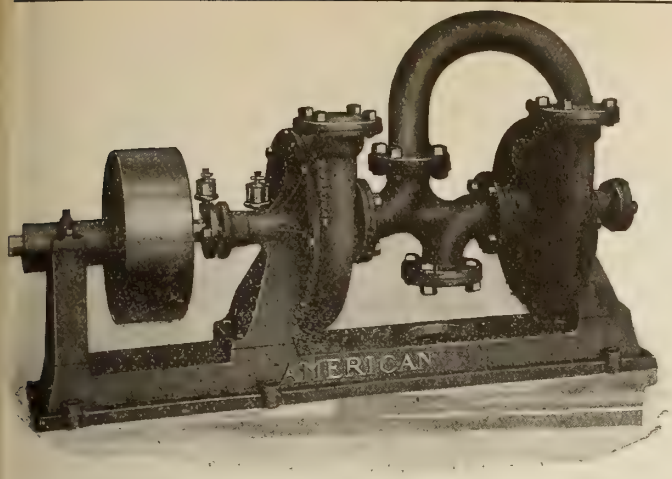


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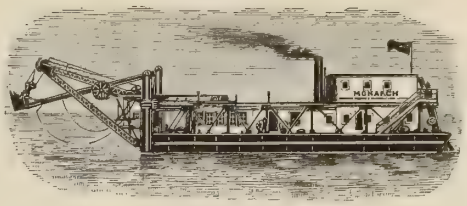
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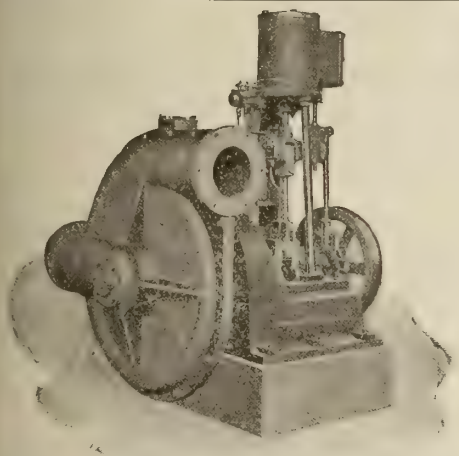
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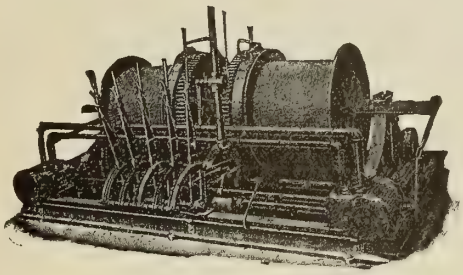
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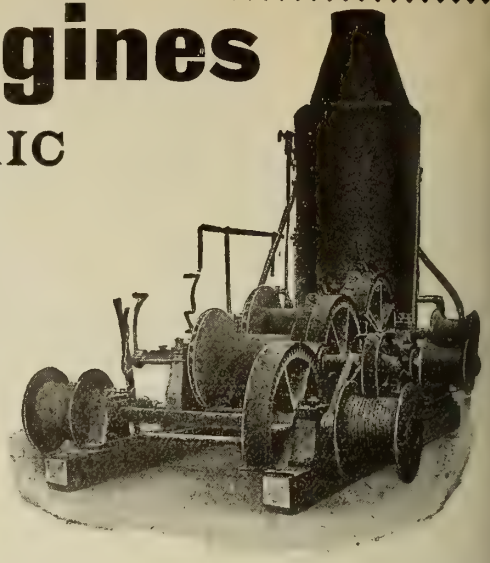
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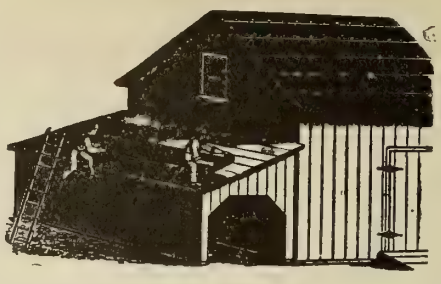
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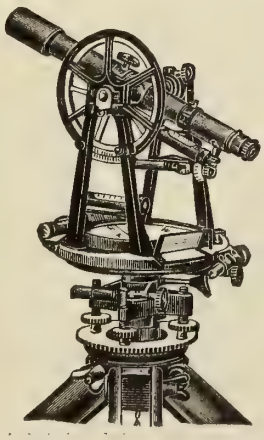
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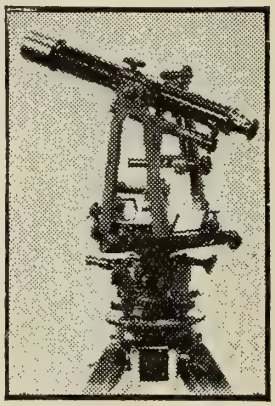
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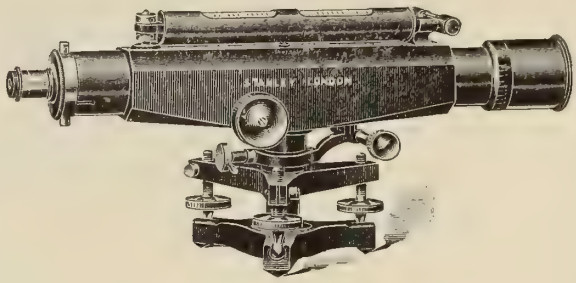
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VOL. I, No. 9, New Series | TORONTO and MONTREAL, July 15, 1907 | Old Series, Volume xxviii, No. 11

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

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TO OUR READERS

THE CANADIAN MINING JOURNAL has made a strong and gratifying start in life. It has reached that stage where change and improvement are pre-requisite to its continued usefulness. Latterly many of our readers have sent in suggestions, embodying their personal wishes. These deal almost exclusively with our news, metal market and other departments. Nearly all of these suggestions we have gladly made use of. All of them are good; some of them, however, owing to reasons which have to do with our own facilities, are not at present practicable. It has been impossible personally to acknowledge all these kind letters. We wish, nevertheless to convey our thanks through these columns.

We also wish to request that all of our readers send us comments, suggestions and criticisms whenever THE CANADIAN MINING JOURNAL fails to supply their needs, whenever they wish to have new subjects dealt with, whenever, in fact, they feel that THE CANADIAN MINING JOURNAL is not adequately and impartially representing the mining interests of the Dominion.

But to be fair to ourselves we must touch on the other side of the shield. Our growth in usefulness and strength must be dependent upon and commensurate with the growth of Canada's mineral industries. We are in no sense the mouthpiece of any special interests. We rely for support upon the legitimate miner, the prospector, the metallurgist and upon all those directly and indirectly concerned with the actual development of Canada's superb mineral resources. It is, therefore essential that all of our readers continue to consider this publication as their special medium, and to act upon the conviction that their interests can best be served only so long as they themselves actively help in making its columns increasingly useful. It were ungracious to conclude this homily without heartily thanking once more those of our subscribers who have of late honored us with letters commendatory and otherwise.

ONTARIO'S VISITORS

The approaching visit of the American Institute of Mining Engineers is an event of more than ordinary importance. The Institute's membership comprises distinguished technical writers, educationists, engineers, metallurgists and chemists. On another page we have reproduced an historical sketch of the Institute, written by its secretary, Dr. R. W. Raymond.

The proposed itinerary of the visitors has already been published. The first meeting in Toronto is called for July 23rd at the King Edward Hotel. THE CANADIAN MINING JOURNAL hopes that the visit to Toronto and

the subsequent tour through Cobalt, Copper Cliff and other places will be made memorable for the American Institute of Mining Engineers.

THE DISCOVERER OF KLONDYKE

Evidence has been gathered which shows fairly conclusively that to Robert Henderson, of Pictou, Nova Scotia, belongs the honor of being the discoverer of Klondyke. In 1894 Henderson was outfitted at Ogilvie by his friend, Joseph Ladue. The summers of 1894 and 1895 he spent in prospecting the streams of the Indian River Valley. During the winters of these years he mined alone on Quartz Creek. In the summer of 1896 he discovered gold in Hunker Creek Valley, or Gold Bottom, as he himself named the district. Provisions gave out in August and Henderson was forced to go to Ogilvie for fresh supplies. On his way back to Gold Bottom, by the Klondyke River, he spent a night on the present site of Dawson. It was here that he came upon Carmack. To Carmack Henderson made known his discovery, and invited him to come up to Hunker Creek and stake. Carmack followed in a few days, staked near Henderson's discovery and, returning, discovered gold in Bonanza Creek. Of this discovery Carmack did not notify Henderson, but proceeded to Forty Mile, where he spread the news. At first his story was received with incredulity, but before long the stampede began, and the new finds were staked out before Henderson had been informd of their existence.

Owing to complications, Henderson was refused a discovery claim on both Gold Bottom and Hunker branches of the river. He was, however, given the choice of staking one ordinary claim on either Gold Bottom, Hunker or Bear Creeks, or the equivalent of one out of five claims staked before others.

Carmack's ingraditude lost to Henderson the chance of controlling the richest gold deposits of the North.

A SUGGESTION

The Nova Scotia Mining Society has striven in several ways to stimulate various branches of that Province's mining industry. Within the past few years the Society has appointed committees to report upon gold mining, iron mining and the clay and cement industries. Although the work of these committees has, in some respects, been disappointing, yet, in the aggregate, very beneficient results are to be observed. Iron mining, for instance, is more actively carried on than ever before, and it is quite within bounds to state that it will very soon become a substantial and thriving industry. Gold mining, despite the Society's efforts, is not in a flourishing condition. We mentioned some time ago the causes that, in our opinion, have militated against the success of gold mining. Nova Scotia needs a practical demonstration of the benefits to be derived from the careful application of clean business principles and economical modern methods. The Richardson gold mine, perhaps, furnishes this. Several other gold mines are in a fair way to do it.

But, to return to the Society's endeavor to promote the mining industry; while tangible results may not in every case be observable, the influence of this organization for good is distinctly traceable in the gradually increasing confidence of Nova Scotians in their own Province's resources. This, in itself, demonstrates that the Nova Scotia Mining Society has not wrought in vain.

In the methods adopted by the Nova Scotia Mining Society there lies a suggestion for the Canadian Mining Institute. There is no reason why the Institute should remain in a state of somnolence throughout those periods intervening between its annual meetings. It may well learn a lesson from its energetic Eastern sister. Committees from the Institute could without difficulty find matters of profound importance to work upon during the year. The varied interests represented by the Institute's membership would gladly support any effort to more closely identify the Institute with the onward march of the sciences of mining and metallurgy.

THE VALUE OF A MINE

It would be hard to damn more conclusively the fatuous newspaper claims, made by certain mining brokers for their undeveloped gold properties, than by recommending possible victims to read thoroughly Mr. J. B. Tyrrell's article on the value of a mine. The first installment of Mr. Tyrrell's paper was presented in our last issue. In the present number appears a second.

One paragraph is exceedingly worthy of assimilation and digestion. It enunciates a principle too often ignored or lost sight of by investors.

Alluding to rates of interest on mining investments, Mr. Tyrell speaks to this effect: "In Canada rates of interest that would be considered fair and reasonable for a mining investment, keeping in view the many possibilities of loss, would vary from seven to twenty per cent." After characterizing as gamblers those who expect higher rates on mining shares, Mr. Tyrrell continues thus:

"In addition to the above rates of interest, the dividends must include certain sums which for a term of years should be credited to a sinking fund for the replacement of capital, and the question of how many years should be allowed for such repayment must be kept constantly and clearly in view, *or the investor will be certain to drop back into the idea that dividends are interest and nothing else.*"

The italics are our own. The sentence italicized expresses tersely and well the precise point on which the ordinary investor in mining property goes wrong. The examples with which Mr. Tyrrell illuminates his argument are typical.

COBALT LAKE

An editorial appeared in our last issue reflecting upon the large capitalization of the Cobalt Lake Mining Company. The Journal recently had an interview with a director of that company. It was suggested that, authough our previous information was, in the main, correct, yet our manner of presenting its might create an unfair impression. For the benefit of all interested we publish the following details. The following statement is given in its entirety:—

"The Cobalt Lake property was purchased by a syndicate of six persons, three representing Toronto and Detroit interests, and the other three representing a large number of parties in the Ottawa Valley. Before these came together the Toronto and Detroit parties had arranged to act independently and to form a company should they get the property. Their arrangements included the allotment of certain promotion stock, the amount of which was eventually fixed at $140,000. To the distribution of this, the Toronto and Detroit parties, represented by the three syndicate members, were agreeable. To effect this a corresponding block of $140,000 in shares was taken by the Ottawa Valley syndicate members, and by them distributed among those whom they represented. The property was transferred by the syndicate to the company in consideration of so many fully paid up shares, each branch of the syndicate getting its proportion, plus its $140,000. At the distribution each subscriber got three shares for each dollar paid, the respective shares of the $140,000. Thus the shares of the Toronto and Detroit subscribers cost them 33 1-3 cents, while those of the Ottawa Valley subscribers cost them approximately 30 cents. The only promotion stock was the $140,000 of the Toronto and Detroit syndicate. Apart from this and the customary brokerage, all the stock issued by the company went to the people who furnished the syndicate with the money for the purchase of the property, all members of each syndicate being treated alike. It is safe to say that few mining companies have been promoted on a more conservative basis.

"It may further be stated that the amalgamation of interests could not have been otherwise arranged, and that without the amalgamation it would have been difficult, if not impossible, to successfully carry out the purchase. Beyond this, the amalgamated interests were able to effect a saving to the parties represented of a sum largely in excess of the par value of the so-called promotion stock.

"As to the capitalization, it was necessary to fix upon an amount in anticipation of the purchase, in order to make a complete agreement between the different interests. The actual amount of stock issued is less than $4,000,000, and as the company has over $130,000 cash in hand for working capital, and over 57 tons of ore ready for shipment, with a completed plant in operation and paid for, there should be no necessity for any further issue, unless the company thinks proper to acquire further property."

We have been requested by the Copper Mining & Smelting Company of Ontario to extend a cordial invitation to the members of the American Mining Institute, during their Ontario session, to visit the company's Bruce Mines property. The officials of the company will be pleased to do all in their power to make such a visit profitable.

EDITORIAL NOTES

A new General Index is to be issued by the Geological Survey of Canada. The work of compiling this Index is under the direction of Mr. Frank J. Nicolas, editor of the Publications of the Survey. Advance sheets of this sadly needed Index display completeness, clearness and an intelligent grasp of essentials. Typographically, very little is left to be desired.

An enormous trust, whose capital reaches $130,000,000, has been formed in Great Britain by nine large iron and steel manufacturing concerns. Vickers, Sons & Maxim organized and promoted the movement. By the absorption of thirty-six independent companies the new combine will control fully 90 per cent. of the steel produced in Great Britain. The avowed object of this organization is to fit Great Britain to cope with German and American competition.

The article on "The Gold Mining Industry of Nova Scotia," which appears in this issue, is the authoritative expression of a mining man who has had splendid facilities for observing the true inwardness of gold mining in that Province. Mr. Brown gives some rather startling facts about gold stealing. He also shows, concisely and clearly, how gold mining has suffered from the early system of granting areas covering only twenty feet along the line of the lode. To those who accept without question the statement that Nova Scotia's gold mines are worked out, we recommend Mr. Brown's thoughtful and enlightened article.

Mr. G. C. Cole, the United States Consul at Dawson, gives in a recent official report a statement of the prices of provisions and necessities at present ruling in the Yukon Territory. These generally, it may be noted, are in the neighborhood of from three to four times as high as those obtaining in Eastern centres, which, conditions considered, does not seem too exorbitant. Thus beef sells for from twenty-five to fifty cents a pound, bacon thirty-five cents, milk thirty-five cents a quart, and flour six dollars a hundred. Two dollars a dozen for fresh eggs, however, would appear somewhat stiff to the economically minded, while one would hesitate before flooring one's abode with hardwood with undressed lumber at four hundred dollars a thousand. Wages in the Yukon remain about the same as three years ago, *i.e.*, $10 a day of ten hours for mechanics; $4 to $5 a day, with board, for ordinary laborers; and clerks, from $150 to $300 a month. The most reasonable charges seem to be for hotel accommodation, which range from $3 to $6 a day; but the Consul refrains from specifying the character of the accommodation offered at this price. The costs of living in the Yukon, will, of course, remain high until existing transporation facilities shall have been greatly improved.

THE AMERICAN INSTITUTE OF MINING ENGINEERS*

By R. W. Raymond.

Having been almost continuously an officer of this society since its organization in 1871, I may claim an intimate acquaintance with its history and administration; and I welcome the opportunity to explain in this contribution some features of its plan which are not perfectly understood by the public. Unfortunately, time is not at my command for an elaborate and complete discussion of the subject, and this sketch must necessarily be brief and fragmentary.

The period following the war for the Union was characterized by great activity in mining, and a great



Dr. Rossiter W. Raymond, Secretary of the American Institute of Mining Engineers.

demand for mining engineers. The mining industry of the Pacific States had been, ever since the discovery of gold in California, the leading factor in the settlement of the country, the improvement of communications and the establishment of civilized communities, with auxiliary agencies of commerce and manufactures, as well as education and religion. The governmental aid given to the Pacific railways, on the ground that these lines were military necessities for the handling of the Indian tribes and the maintenance of sovereign Federal authority throughout the vast Pacific slope, could have scarcely been secured, had not the mineral resources of that region given it a thrilling romantic interest and a boundless value in the eyes of the people of the East. At the same time, the exploitation of the Western mines and the rapid development of coal, iron and copper and lead mining in the other States, called for trained engineers; and successive technical schools were established in response to this demand, while technical journals flourished and became more and more devoted to problems of theory and practice, as well as records of new enterprises. Meanwhile, the actual mining engineers of the United States—those who were doing the great work of mining both East and West—could not be said to form an organized profession at all. There were a few graduates of foreign schools; many civil engineers who had turned their attention to mining; a much larger number of miners from Cornwall or Germany, who had risen to be mine captains and "experts"; and a still larger number of self-taught American miners and prospectors, ignorant and jealous of book knowledge, and over-conscious of superiority in many respects to its possessors and professors. This heterogeneous multitude had no common ground for the interchange of views and experiences, and no organized common feeling inducing them to seek and occupy such a ground. The technical journals and the technical schools alike are needed to be reinforced in their endeavors by some agency which should promote personal acquaintance and mutual esteem among the men in whose hands were the mining operations of America.

It was my realization of this feature of the situation that led me, as the editor of *The Engineering and Mining Journal*, to attend at Wilkes-Barre, in May, 1871 the meeting called by three mining engineers, Eckley B Coxe, Richard P. Rothwell and Martin Coryell, to organize an association. As a beginning, in default of a duly elaborated scheme to suit our special case, the Rules of the North of England Institute of Mining Engineers were adopted in substance, and the name of "The American Institute of Mining Engineers" was chosen for the new society without debate, as a matter of course. The rules were subsequently re-written; but the name, though in some respects a misnomer, since it does not fully describe the scope of the Institute, has survived, and has become so dear to the members and so well known to the world, that it is not likely to be changed. A lucky misnomer is sometimes a "mascot."

At the outset, a most important question arose, the settlement of which involved the whole future of the society. Several educated engineers protested against the admission to full membership of persons not belonging to the profession, and not possessed of a certain degree of professional standing and experience. They could not insist upon the degree of M.E. or E.M. as a qualification. They did not themselves hold that degree but they felt that C.E. or its equivalent in certified experience and knowledge ought to be required. In word, they did not wish to recognize as fellow-members (though they would consent to admit as associates) common miners, foremen and self-educated mine captains.

There was much to be said in favor of this feeling. Professional societies usually represent professions, and membership in them is accepted as a guaranty of professional standing. Consequently, they make carefu

*A paper presented to the American Mining Congress, at Denver, Colo., October 16th, 1906.

preliminary examination into the training and achievements of candidates, and sometimes impose a period of quasi-probation as "junior" before advancement to full membership. All this is excellent, for the purpose for which it was designed. But that was not the purpose of the Wilkes-Bare meeting of 1871; and if that had been its purpose, the movement would have failed. This point is so important as to warrant further explanation.

There was at that time no such thing in the country as a distinct profession of mine engineering, numerous enough to support an active and useful society. Any attempt to create one by means of a society would have resulted in a small, select (*i.e.*, self-selected) coterie, barren of influence and outside of practical connection with the national mining industry.

The pressing need of the hour was not the segregation of a select body, but the cordial co-operation of all the representatives of a great industry or group of industries. This could only be effected by bringing together on terms of friendly equality the schoolmen and the fieldmen, and persuading the latter to do what they were naturally shy and reluctant in attempting, namely, to tell what they knew, for the benefit of all. Unquestionably the self-educated, practical mining men and furnace men at that time knew more than the school graduates about the actual facts of American ore deposits, mine workings and furnace management. It was not the nominal manager but the Cornish captain who knew the mine; it was not the chemist, but the founder who ran the furnace. If these practical men were slighted at the beginning, they would stand aloof, giving no aid in the way of fresh facts, and leaving the theorists to exchange their speculations with little profit, like the traditional boys confined in the garret, who professed to have made money by swapping jacknives, back and forth.

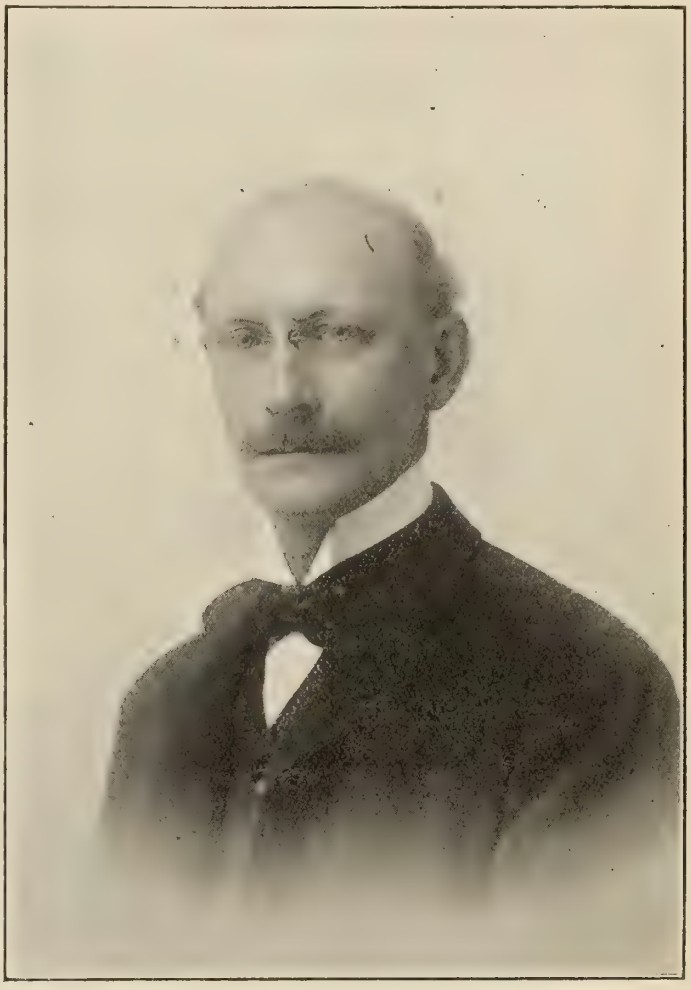
Again, the work of publishing and distributing useful information could only be done upon an influential scale by a society with a large income; and this would require either a select, small society supported by heavy annual dues, or a numerous membership paying small dues. Beyond question, the latter was both easier to secure and more fruitful of influence as well as revenue. The result of thirty-five years' experience has left no doubt on that head. What the Institute has given to its members in the way of publications for the annual fee of $10 may be confidently compared in both quantity and quality with the similar publications of any society in the world, supported by annual dues of twice or thrice that sum.

Another point is worthy of note. A large membership, even if it be not narrowly confined to men of a certain ascertained standing in a single profession, furnishes an attractive and inspiring public to ambitious authors. A famous engineer (member of several other American and foreign professional societies, as well as of our Institute) once said to me: "The Institute is an association largely composed of young men with reputations to win, instead of older men with reputations to maintain. The consequence is, that your members are eager to communicate what they know or think, instead of being afraid to 'give it away,' or reluctant to incur criticism by offering professional contributions not monumentally complete and creditable to their acknowledged professional standing."

The *Transactions* of the Institute illustrate the truth of this keen, discriminating observation. Some of their most valuable papers have come from men who could not have claimed membership in more "select" societies, and who wrote, not because they were already known, but in order to make themselves known.

At all events, the force of circumstances dictated, and the experience of thirty-five years has approved, the decision which admitted to membership in the Institute all persons trained for, or practically connected with, the professions and industries which it represented.

But this decision involved the simultaneous adoption of another. In 1871 (and the same is true to a more limited extent to-day), the American mining engineer had to know many things besides mine engineering proper. He was expected to do, or intelligently to superintend, the work of assaying, milling, smelting and general construction and management. Moreover, a man who was running the mine to-day might be superintending the furnace to-morrow. Hence it was found both advisable and practicable to include in the membership of the Institute those who were connected with geology, chemistry, and civil, mechanical or electrical engineering, as applied to mining or metallurgy.



James Gayley, President of the Corporation and Past President of the Council of the A. I. of M. E.

The American Society of Mechanical Engineers and the American Institute of Electrical Engineers are both younger than our Institute, and, in some sense, its offspring. They have fields of their own, which they most creditably occupy; yet great numbers of their members still seek or retain membership in the Institute of Mining Engineers, and the Institute has had no reason to close the doors once opened to such candidates.

The original scheme of the Institute led to an unprecedented growth, both at home and abroad. The mem-

bership increased rapidly from year to year, and now numbers more than four thousand names, distributed throughout the world. This forced upon the management two additional problems: one of government; the other of policy.

The meetings of the Institute were, from the beginning, peripatetic. Nothing else could have prevented its degeneration into a local organization, or kept alive the national sympathy necessary to its success. Until its incorporation in 1905, it had no official headquarters aside from the office of its secretary, which had been located, without any official action, wherever the secretary happened to reside—first at Lambertville, N.J., then at Philadelphia, then at Easton, Pa., and finally at New York. It was manifestly impracticable to leave the decision of business questions to the vote of such members as might happen to attend a meeting in some particular locality. Consequently, almost absolute powers were given to the council, chosen annually by postal ballot.

But such a grant of absolute power demands a precise limitation of its sphere; and accordingly the council of the Institute was prohibited from any act or utterance outside of the management of the proceedings of the society itself, namely, the holding of meetings and the acceptance, publication and distribution of papers. Gradually it came to be recognized that the Institute itself, as represented by the members attending a given meeting, was still less competent than its representative council to express opinions or approve of any kind outside of its own immediate affairs; and the final result was the present rule:

"The Institute shall not assume responsibility for any statements of fact or opinion advanced in the papers or discussions at its meetings. Neither the council nor the Institute shall officially approve or disapprove any technical or scientific opinion or any proposed enterprise, outside of the management of the meetings, discussions and publications of the Institute, and the conduct of its business affairs by the board of directors."

This policy is not only approved by our experience, but also founded in a correct theory of the relation of the Institute to its individual members.

A man who joins the society for the sake of the benefits offered by its publications and its fellowship* has a right to the assurance that neither his name, his money, nor the influence of the organization which both his name and his money have strengthened, shall be used to promote any outside cause whatever. No matter how ignorant or prejudiced he may be, he is entitled to be protected against unwilling partnership in an opinion, or a movement, or an enterprise which he has not contemplated.

Several instances from the earlier history of the Institute will further illustrate this principle.

In the first decade there was a brilliant discussion before the Institute of the question "What is Steel?" and in 1876 an international committee of high distinction reported for our adoption a new nomenclature for the products of the iron blast furnace, the Bessemer converter, the forge and the crucible. But, underneath the technical questions involved, there were important questions of tariff classification, involving, perhaps, millions of dollars; and a sweeping decision of the Institute on either side of the case would have been used in argument before the United States Treasury Department, to the injury of the business interests of many members. This result was wisely averted by a refusal to promulgate any such general decision.

Later, there was a memorable debate, concerning the metric system of weights and measures, on a resolution recommending Congressional legislation to make this system obligatory. Here, again, the proposition was passionately opposed by members whose business interests would, at least in their own opinion, be injuriously affected by it, as well as by those who, on principle, disapproved it. In this case, the speeches on both sides were reported in the *Transactions;* but when the time came to vote on the resolution itself, the presiding officer declared it to be out of order, as not included in the declared purposes of the Institute, and, therefore, declined to put it to vote. This decision, sustained by the meeting, may be said to have settled, once for all, the principle which, after several similar precedents, was formally embodied in the rules already quoted.



United Engineering Societies Building.

It is evident that no rule of this kind could be enforced if there were any recognized distinction as to the merit of the scheme or proposition seeking support. Such a scheme or proposition, if of such a character as, almost

*I must be content with a mere passing notice of the advantages of this fellowship, which has proved in innumerable cases the sufficient motive for a frank interchange of information, quite outside of the formal published papers and discussions. It has been for many years my practice as secretary to refer members desiring information which I did not possess to other members who had it. And I can recall no case in which such an appeal did not meet a courteous response.

beyond doubt, to command the hearty assent of all members, would surely constitute an excellent precedent and illustration for the support of the existing rule.

Ever since the Institute became successful, influential and widely known, innumerable attempts have been made in entire good faith, to secure the aid of its name and authority for propositions honestly believed to be (as, in most cases, they were) meritorious. Recommendations that Congress should make appropriation for the representation of the United States mineral industry at this or that exposition at home or abroad; that the Institute should unite with this or that society to form a joint committee on national or international standards, etc., have all been "turned down"—the more meritorious, the more promptly. It was the only way to preserve our plan and purpose.

This statement may explain why the Institute and its officers, as such, have taken no part in the successive meetings of the American Mining Congress, with the purposes of which a large number of our members are in sympathy.

I feel bound to add that the restricted policy above outlined has had somewhat unexpected and most gratifying results. The Institute has been the forum, and its *Transactions* the records, of the free discussion of nearly every important and pertinent question connected with



The Auditorium.

the progress of modern engineering. Expressing no opinions, we hear all, and furnish to the proposer of any reasonable novel view an appreciative audience. And no student of the practice of the last thirty years in any department represented by our membership can afford to overlook the authoritative and suggestive contributions made by us to the technical literature of this generation.

There are many other features of the history, tradition, and consequent present administration of the Institute, concerning which I would gladly speak, and feel myself exceptionally qualified by circumstances to speak; but I cannot thus add to the present sketch, which, I venture to hope, has explained (and even justified) the three leading peculiarities of the Institute, namely:

1. Its wide and liberal conditions of membership.
2. Its absolute government by a central body—*i.e.*, its representative, rather than purely democratic, organization.
3. Its strict limitation of the functions and powers, both of the governing body and of the Institute as a whole.

Each of these features has been often criticized, usually in perfect good nature and good faith. I shall not now undertake to offer any further defense of them, not incidentally implied in the foregoing explanation. But I think I may fairly claim to have shown that they came into existence as the natural and necessary results of the conditions attending their origin. Even if something better might have been imagined, nothing better could have been done.

Finally, may I not modestly, but confidently, claim that the results of this enterprise, whatever may have been the defects of its plan, have been, somehow or other, such as to warrant us in "letting well enough alone?"

THE VALUE OF A MINE

By J. B. Tyrrell, Mining Engineer, Toronto, Ont.

(Continued from June 15th.)

We have seen that investment in mining securities, if judiciously made, must allow for the redemption of the capital invested within a stated time, as well as for the payment of interest on that capital at a rate commensurate with the risk incurred

In Canada rates of interest that would be considered fair and reasonable for a mining investment, keeping in view the many possibilities of loss, would vary from seven to twenty per cent. Many men who buy mining shares are looking to make a hundred per cent. within a few weeks, but these people are not investors, they are gamblers, some of whom will be allowed to win in order that many more may be induced to stake their money on the same gaming tables.

In addition to the above rates of interest, the dividends must include certain sums which for a term of years should be credited to a sinking fund for the repayment of capital, and the question of how many years should be allowed for such repayment must be kept constantly and clearly in view, or the investor will be certain to drop back into the idea that dividends are interest and nothing else.

In some large producing mines and more especially in the gold mines of the Transvaal, where the tonnage and value of the reef can be closely calculated, the length of time that it will take to exhaust the property and the net profit that will be realized during that time, are known. For instances, the Robinson Mine, one of the greatest gold mines of the world, is capitalized at £2,750,000, or $13,337,500, in 550,000 shares of £5 each. This mine is stated to contain a body of ore which will yield about $42,000,000 in dividends, and which can be extracted in twelve years, when the mine will be exhausted. In twelve years, therefore, this mine will pay back its capital of $13,337,500, with interest at 19 per cent., 3 per cent. being credited on the dividends as they are paid from time to time. At the present price of the shares, namely, £8.5, or $40, the actual capital is $22,000,000, and the mine, before its exhaustion, will pay this back with interest at 9 per cent.

In most producing mines a certain quantity of ore is blocked out on three or four sides ahead of production, as much as the management expects to extract in two, three or four years, as the case may be. The quantity and value of this ore is known with a reasonable degree of certainty, while for the rest the investor must be satisfied with the best estimate that he is able to obtain. Let us assume that the mine is capitalized at one million dollars in shares of $1 each; that after careful examination and sampling it is found to contain ore blocked out which will yield a net profit of $900,000; that the

ore which is not blocked out is estimated to yield profits of $1,300,000; that the estimated time in which this ore can be extracted is ten years; and that the plant at the end of this time will be of no value. During the ten years it will pay $220,000 a year, or an annual dividend of 22 per cent. As there is such a large body of payable ore blocked out and proved, making dividends to almost the full amount of the capital certain, the investor might probably be satisfied with 8 per cent. interest. On this basis, and allowing as before 3 per cent. interest on all money paid as dividends, the present value of this mine is $1,315,000, and the shares are therefore worth $1.32.

If all the ore could be extracted from the above mine in five years instead of ten, it would be yielding profits of $440,000 a year, or dividends at the rate of 44 per cent. on the capital, but still on account of the deduction of 20 per cent. each year from the dividend for the repayment of capital, the shares would only be worth $1.64.

If on account of the installation of new plant or for other reasons the first dividend should be deferred for two years, and should then continue for ten years thereafter, the shares would be worth $1.13.

Another mine is capitalized at $1,000,0000, in $1 shares. It contains 4,000,000 tons of low grade ore, say of one of the baser metals, which will take twenty years to extract. At the present price of the metal a profit of $1.50 a ton could be realized. What the price of the metal will be a few years hence it is imposisble to predict; it might drop so that the mine would be unprofitable and would have to be closed down. In the case of an investment in such a mine the risk of loss would be great and a corespondingly high rate of interest should be demanded, probably 15 per cent. and possibly 20 per cent. At the former rate the shares are worth $1.60, and at the latter rate $1.26.

Again, a mine is capitalized at $1,000,000 in $1 shares. It contains ore which will yield a net profit of $300,000 blocked out, and this ore can be extracted in two years. Beyond what has been blocked out, very little payable ore is to be seen, and though there may be much ground on the property which would seem to be worth prospecting, the possibility must be recognized that this ground may prove unproductive and at the same time part of the profits derived from the ore blocked out may be used up in prospecting it. In this case the only sure profit is the $300,000. This, allowing interest at the rate of 10 per cent., is worth $253,000, giving a value of 25 per cent. per share for the stock. Any price paid above this is purely speculative, paid on the chance that more payable ore will be found on the claim. The purchaser who pays, say 70 cents a share, should therefore fully understand the risk that he has taken and should not complain, or blame the mining industry, if when the mine is exhausted he finds that he has lost most of the money that he invested in it.

Examples of mine values might be multiplied indefinitely, but the above will give some idea of the principles which should guide the investor in mining stocks if he wishes to place his money with reasonable certainty of good returns.

The investor has to be taught that a proper estimate of the ore reserves—in their relation to the mine's market valuation—is the real fact to grasp. If people neglect this fact they will, in the long run, lose by buying mining shares.

As a rule every man considers himself competent to invest in mines, but it is worth recording here that professional rather than amateur knowledge on this subject, as on all other subjects, is more likely to stand the test in the long run.

THE INSTITUTION OF MINING ENGINEERS

The forty-sixth annual meeting of the Institution of Mining Engineers opened on the 13th of June at the rooms of the Geological Society, in London. Mr. Maurice Deacon, the president, in the course of an address gave a brief history of the Institution, which was formed in the year 1889 with the object of broadening the sources of information upon matters affecting the profession of mining engineering by amalgamating the several mining institutions of Great Britain into one consolidated body. With the exception of two societies, the South Wales Institute of Engineers and the Institution of Mining and Metallurgy, which continue as independents organizations, the object of the Institution has been attained. It now has a membership of 2,972 federated and 73 non-federated members, representing an increase of membership in fifteen years of over a hundred per cent., whilst the financial showing is also satisfactory, subscriptions having increased nearly 170 per cent.

The address refers to recent legislative enactments in Great Britain affecting the mining industry, and especially deprecates the passing of the Workmen's Compensation Act, in consequence of which, it is feared, costs will be increased by the largely advanced premiums that insurance companies are demanding upon their present scale. Among other items of mining legislation promoted in Parliament, the following bills are mentioned:—The Coal Mines Regulation Bill, Engines and Boiler Bill, and two bills for limiting the period of working underground. In reference to the foregoing, Mr. Deacon points out that the proposal to again disturb the Coal Mines Regulation Act appears to be unnecessary and undesirable, and likely to introduce fresh difficulties in the management of mines, coupled with an increased cost of production. The proposals of the Eight Hour Bank to Bank Bill are fraught with danger, not only to the British industries and the public in general, but to the men in whose supposed interest the bill was introduced. At the present time few men work over eight hours a day, but by the passage of the Act the time available for coal-working would in many cases not exceed six hours a day, and in those mines where the working face is situated a long distance from the pit bottom, probably not more than five and a half hours a day. To quote Mr. Deacon: "The effect of such a serious limitation . . . would be to so seriously increase the cost of production that those industries which are of necessity large consumers of coal, especially the iron and steel trades, would be injuriously prejudiced in competition with other countries, to the grave detriment of the trade generally. . . To what extent the price of fuel would rise it is, of course, impossible to suggest, but that a reduction of 20 to 25 per cent. in the output, which would probably accrue, would result in a great scarcity of coal, and that such a scarcity would create a considerable rise in the price cannot be questioned." Mr. Deacon stated that some years ago he made an experiment to test the practical result of a limitation of hours of working, and found that the output of a certain colliery was reduced by 27 per cent. below the output obtained on a normal day of nine hours' winding.

Allusion was also made in the address to the increased progress that has been made of late in the mechanical engineering of British collieries. Thus, in seams which

are worked to the dip, mechanical haulage has replaced the employment of horses, and in Warwickshire, where several seams are worked in conjunction with one another and brought to one main gate road, it is the custom to employ a small haulage set on every gate road, as well as on the subsidiary levels or cross-gates. Economies have also been effected by the use of steel props and girders, while electric cutting machines have been largely adopted of recent years in seams of varying thicknesses and conditions. In some thin seams conveying belts are in use along the working face to the gate ends, where the height is insufficient to permit an ordinary car to be loaded, and heading machines, by which as much as 36 yards of coal heading per week has been cut, have also played an important part in mining thick seams.

The improvement in the surface mechanical equipment of collieries is stated as being still more marked. For example, by the use of high pressure steam, coupled with more economically designed engines, by the greater use of expansion gear, and sometimes by super-heating and condensing, the steam consumption of modern collieries has been greatly reduced. Winding engines which formerly consumed 70 or 80 pounds of steam per indicated horse-power may now be found using not more than 30 pounds whilst continuously running engines and steam turbines, for fan and electric driving, are in some instances working with not more than 14 or 15 pounds of steam per indicated horse-power.

There is, perhaps, no greater necessity in connection with the working of a colliery than the provision of pure boiler water, and British colliery engineers have of late given considerable attention to the treatment of impure water to fit it for boiler use, while, too, the better utilization of the calorific value of fuels by the use of gas producers and gas engines has not been disregarded, and in the case of plants of 1,000 kw. and upwards, working costs as low as 0.25d. per kw. have been obtained.

The address concludes with the following pregnant paragraph:—

"The careful consideration of economies in fuel for colliery purposes becomes increasingly important by reason of the greater depths from which the coal of the future will of necessity be wound. The question of raising large quantities of coal from depths of 2,500 feet to 3,000 feet, which will have to be confronted on a large scale at an early date, opens up a fresh field for the exercise of the ingenuity of the mining engineer. In the case of collieries sunk to such depths, where only one workable seam is available, very large areas, probably not less than 18 to 20 square miles to each pair of pits, will be necessary, to warrant the heavy capital expenditure entailed in sinking and equipping plants of the magnitude which will be necessary to raise the large quantities of coal required to produce a low cost and enable a reasonable return to be made upon the large capital involved."

THE NEW TILBURY AND ROMNEY OIL FIELDS OF KENT COUNTY, ONTARIO

By Eugene Coste, E.M., Toronto.

(Toronto Meeting, 1907.)

Oil was first struck in the new Tilbury field in December, 1905, on the John Kerr farm in the northwest part of lot 10 of the Middle Road, North Range of the Township of Tilbury East, in the County of Kent, Ontario. The first well as drilled by the Acme Oil Company of Detroit. This company had been operating unsuccessfully in the narrow Leamington pool in the adjoining County of Essex. Before finally abandoning its venture in oil it decided to take another chance, and this time of a purely "speculative" nature, as the location selected was in an entirely new and undeveloped territory. As luck would have it, it turned out to be a winning throw. At the depth of 1,360 feet a rather strong gas vein was struck; then another at 1,375 feet; then the first oil pay with more gas at 1,385 feet; then a second oil pay at 1,410 feet and a third one at 1,430 feet. A little below that some salt water was found and the drilling was stopped at 1,450 feet. The well after the shot started to flow at the rate of 40 barrels of oil per day, the gas being quite strong, about half a million cubic feet per day.

The second well was drilled in at the end of March, 1906, on the Janes farm, about three-quarters of a mile southwest of the first well. It struck gas and oil at about the same depths, but it proved to be a small well, not starting at better than eight or ten barrels per day after the shot.

The third well was completed on April 6th, 1906, on the J. Smith farm, half a mile southeast of the first well, and it started at the rate of sixty barrels per day after the shot; the first gas was struck at 1,363 feet and the first oil at 1,393 feet; the second oil at 1,418 feet and the third pay of oil, which was the best, with some salt water, at 1,430 feet.

A great many other wells followed rapidly thereafter, and to date not less than 150 wells have been drilled. These prove that the good oil territory of the Tilbury field extends at least over an area of two miles east and west by five miles north and south, and the limits of the field to the south and north are still unknown. Only three or four dry wells have as yet been encountered over that large area of 6,400 acres, and a number of very good wells (century wells) have been struck. The largest of these is the A. Simard well of the Central Oil & Gas Company in the northwest part of the field, as at present developed, which started to flow naturally, that is, without being shot, at the rate of 1,500 barrels per day of fluid, 1,200 barrels of which were salt water and 300 oil. This well is now over two months old and is still flowing naturally about 200 barrels of salt water and 50

barrels of oil per day. The oil, water and gas were all struck at the same time at a depth of 1,445 feet. Only about 150,000 cubic feet of gas per day having been reached at the depth of 1,436 feet.

Large gas wells have also been struck in this field, the largest being the Volcanic Oil & Gas Company's well on the David Halliday farm in the northwest part of lot1 in the sixth concession of the Township of Raleigh, which adjoins the Township of Tilbury East to the northeast. Gas was struck at 1,417 feet, drilling being stopped at 1,421 feet in the middle of the gas pay, as the well was then measuring seven million cubic feet per day of dry gas. It was tubed with 3 inch tubing, packed with a Dresser packer and closed in on the 16th of September, 1906. The regular rock pressure of the closed-in gas was 650 lbs. to the square inch.

The gas from this well has since been piped to the City of Chatham, ten miles distant, where it would now be sold for 15 cents and 25 cents per thousand cubic feet, if, instead of facilitating the advent of such a cheap and incomparable fuel, an antiquated law known as the "Gas Inspection Act" (which declares that there should be no trace of sulphuretted hydrogen in any gas used for illuminating purposes) had not prevented its use by the people of Chatham for the greater part of this winter. Backed by the provision of this old law, some of the aldermen of the City of Chatham entertained the idea that this natural gas from the Tilbury field, which certainly contains some sulphuretted hydrogen, as evidenced by the smell of it, would poison the Chatham consumer. The writer mentions this matter here as he believes that it is the first time on record that this question of the supposed poisonous nature of natural gas has been raised on the introduction of it into a city. At the instance of the City Council of Chatham, this natural gas from the Tilbury field has just been analyzed by Prof. E. B. Shuttleworth, of Toronto, with the following results:—

Hydrocarbons, principally methane ...	92.20
Carbon dioxide	1.40
Oxygen	Trace.
Carbon monoxide	0.21
Hydrogen	4.40
Nitrogen	5.59
Sulphuretted hydrogen	0.20
	100.00

which compares as follows with the natural gas from Ohio and Indiana, according to analyses published by the late Prof. Edward Orton in his "Geology of Ohio," volume 6, page 137:—

TABLE OF ANALYSES OF NATURAL GAS FROM OHIO AND INDIANA.

Gas.	1	2	3	4	5	6	7
Hydrogen ...	1.89	1.64	1.74	2.35	1.86	1.42	1.20
Marsh gas ..	92.84	93.35	93.85	92.67	93.07	94.16	93.58
Olefiant gas	0.20	0.35	0.20	0.25	0.49	0.30	0.15
Carbonic oxide	0.55	0.41	0.44	0.45	0.73	0.55	0.60
Carbonic acid	0.20	0.25	0.23	0.25	0.26	0.29	0.30
Oxygen . . .	0.35	0.39	0.35	0.35	0 42	0.30	0.55
Nitrogen . .	3.82	3.41	2.98	3.03	3.02	2.80	3.42
Sulphuretted hydrogen .	0.15	0.20	0.21	0.15	0.15	0.18	0.20

LOCALITIES.

1. Fostoria, Ohio.
2. Findlay, Ohio.
3. St. Mary's, Ohio.
4. Muncie, Indiana.
5. Anderson, Indiana
6. Kokomo, Indiana.
7. Marion, Indiana.

It will be seen from the above analyses that, so far as the sulphuretted hydrogen is concerned at any rate, there is absolutely no difference between the Tilbury field gas and the Ohio and Indiana gas taken at a number of places widely scattered over these two States, and where it has been used for all purposes without the slightest harm to anyone for a great many years by thousands of people. It is clear, therefore, that our gas inspection act is onerous and needs to be amended to permit in Canada the use of natural gas for domestic and other purposes, as unrestrictedly as it is used in the United States. It is clear, also, that the City Council of Chatham has been altogether too particular in its acceptance of so well and so favorably known an article as natural gas.

The oil of the Tilbury field also contains some sulphur, which gives it a strong odor peculiar to the crude oil known in the States as "Lima" oil. It is a dark green in color, of 38 to 41 degrees Baume gravity, and belongs to the same class as the Lima, Ohio, the Indiana, and the Petrolia and Oil Springs (Ontario) oils. It is bought from the producer at the present time only by the Imperial Ail Company of Sarnia, Ont. This company has established a pumping station and tankage in a central part of the field, from which it pumps the oil through a 4 inch and also through a 2 inch line owned by them to Merlin, Ont., on the Pere Marquette Road, four and a half miles distant. From there the oil is taken over that road in tank cars of the Imperial Oil Company to their large refinery at Sarnia. The oil is bought by the Imperial Oil Company at the tanks at each well, and they pay at present for it $1.14 per barrel. After the oil has been accepted and the tank has been gauged, the oil is run by means of a donkey pump through 2 inch lines owned by the Imperial Oil Company to their tanks erected at the central station. The well tank is again gauged after the run and the different in the two gauges gives the amount of oil sold, for which the Imperial Oil Company gives the producer a run ticket and also a vouched ticket. in order to enable him to collect the Government bounty of 52 1-2 cents per barrel. The total price, therefore, at present obtained by the producer for his oil is $1.66 1-2 per barrel, less the royalty, generally one-eighth to the owner of the land, the oil and gas rights of which are generally only leased by the producers. Two years ago, before the Dominion Government removed the import duty protecting Canadian crude oil, the average price of it in Canada was, for the previous year, $2.12 . By the bounty system, therefore, versus the duty system, the net result is a loss to the oil producer of $2.12 less $1.66 1-2 or 45 1-2 cents per barrel, and another loss to the Dominion Government of 52 1-2 cents per barrel, while the refining companies make all the gain, which I am not aware that they share with the consumer. With the duty removed they can now obtain their crude oil cheaper from the States, so much so that the Canadian Oil Company, the only independent refiner now in Canada, gets all its supply of crude oil from Ohio and, the writer believes, buys no Canadian oil from any of the fields, certainly none from the Tilbury field. The price of Canadian oil is therefore governed and controlled by the American market, while the Canadian producer

operating in the deep fields is at a disadvantage in being called on to pay a heavy duty on his drilling outfits, machinery, cordage, tubing, lead lines, etc. As mentioned above, the oil in the Tilbury field is in a deep sand (about 1,400 feet), and consequently all the drilling done there is done by the American cable tool system; the Canadian pole tool system being too slow and not suitable for wells of that depth. These American cable tool outfits cannot be obtained in Canada, nor can the 1,500 pound test 2 inch tubing, and other 2 inch high pressure lines which the Tilbury field producer must have, and on all of this he must pay a heavy import duty. It is quite clear, therefore, that the Canadian deep oil producer would receive greater encouragement to test and develop deep oil fields in Canada if he had no duty to pay on his materials, which he necessarily imports from the States; and if the price of his product was protected at present receiving a bounty on his product from the by an import duty on American crude oil instead of as Dominion Government, which he practically returns in the form of duty on his equipment, while at the same time his price is slaughtered in competition with cheap American crude oil.

Geology.—The Tilbury oil and gas field lies under a flat drift-covered section of the country, the elevation of which is about 600 feet above the sea. The drift is about 150 feet thick in the south end of the field and about 100 feet in the north end, and is composed of boulder clay on the top and sands and gravels varying very much in thickness below. The first strata struck under this drift are the grey blue shales of the Hamilton or Middle Devonian formation—the so-called upper soapstone or soap of the Petrolia driller; then comes the middle lime and the lower soap of the same formation, followed by the Corniferous or big lime of the Lower Devonian, which is struck at depths ranging from 230 to 285 feet, and is about 150 fee thick. Below this are the Dolomitic limestones with flint and gypsum of the Onondaga, or Upper Silurian, a little more than 1,000 feet thick; then comes the Guelph and Niagara, Silurian dolomitic limestones in which, so far, the drilling of the wells has been stopped, but it is likely that, in future, in some parts of that field or not far from it, the wells will be drilled deeper still and will obtain their gas and oil either from the Clinton limestone immediately underlying the Guelph and Niagara, about 150 feet thick in that section of the country, or from the still deeper strata of the Trenton limestone, lying about 900 feet under the Clinton, from which it is separated by the Medina, Hudson River and Utica soft shales, which can be drilled through very quickly and cheaply.

The gas and the two upper oil pays in the southern part of the field are found in the lower brown dolomites and gypsum of the Onondaga, while the lower oil pay is struck in the upper beds of the Guelph and Niagara. In the north end of the field, north of the Michigan Central Railway, the lower beds of the Onondaga are barren of oil, which is there altogether found in the Guelph, but the gas is still found there in the lower beds of the Onondaga in the strata which form the first and second oil pays of the south end of the field. In the east middle part of the field, on the other hand, the oil is struck in the Onondaga strata which constitute the gas pays in many of the wells of the middle western part of the field, such for instance, as at the J. W. Campbell No. 1 well of the Central Oil & Gsa Company, the log of which is here appended:—

LOG OF THE CENTRAL OIL & GAS COMPANY'S WELL NO. 1.

(S.E. corner of Lot 6, in the 9th Concession of the Township of Tilbury East, Kent County, Ont.) Elevation 600 feet A. T.

Formation	Description of Strata.	Thickness feet	Depth feet	Remarks
Drift	Boulder clay	95 to	95	A little gas.
	Grey sand	5 to	100	10″ drive pipe to
	Clay and gravel ...	28 to	128	138 feet.
Hamilton.	Blue clay shoal (upper soap)	37 to	165	
	Middle lime	10 to	175	
	Blue clay shoal (lower soap)	67 to	242	
Corniferous or Big Lime	Yellow limestone..	158 to	400	8″ casing to 343 ft. A show of oil at 250 ft.
Onondaga .	Grey, drab, brown and blue dolomites with gypsum and flint (shaly, series with darker shaly dolomites & more gypsum from 835 to 1185)	1020 to	1420	6½″ casing to 835 ft. Gas at 1250 ft. 1362 ft. 1370 ft. 1376 ft. 1382 ft. Oil at 1397 to 1400 ft. and at 1416 ft.
Guelph . ..	Blue white dolomitic limestone	9 to	1429	Oil at 1426 ft.

A little gas is also often found in this field in the sand or gravel at the bottom of the drift, also in the upper part of the Corniferous in some of the wells, while in other wells some gas and a little oil were found in the upper beds of the Onondaga between 500 and 600 feet. There is also another vein of gas in some of the wells at about 1,250 to 1,280 feet in the Onondaga, all of which shows the adventitious nature of the gas and oil in the different porous strata or reservoirs of this field, which does not in this differ from many other oil and gas fields. This fact, as I have shown in one of my papers before this Institute ("The Volcanic Origin of Natural Gas and Petroleum," Vol. 6 of the Journal of the C. M. I.), that gas and oil always impregnate the porous portions of the great thicknesses of strata from the Archean to the drift, many of which strata are very impervious, constitutes one of the very strong proofs of the volcanic nature of these products. For other proofs of the volcanic origin of oil and gas, reference may be made to the above mentioned paper, the arguments in which have not yet been successfully refuted.

The Romney oil field, or rather pool, as it is yet only about three-quarters of a mill long and only a few hundred feet wide, is situated some seven miles southwest of the Tilbury field in the north parts of lots 21, 22 and 23 in the 4th concession of the Township of Romney, Kent County, Ont. It is only a few months old and there are now seven producing wells in it, several of which came in as very large wells, making each over 1,000 barrels per day of oil. The oil is struck at the shallow depths of 200 to 270 feet, in the upper part of the Corniferous formation or Big Lime, the top of which is struck there at 180 feet. The oil is heavier than the oil of the Tilbury field, about 28 to 30 Beaumé. It is piped and shipped from Coatsworth station on the Pere Marquette to the Sarnia Refinery of the Imperial Oil Company, which now pays 84 cents per barral for it at the wells.

Five miles further southwest again, in lot 11 of the 2nd concession of Romney, oil was struck some few years ago in the Guelph formation at 1,290 feet. The wells were pumped for quite a while, but abandoned on account of their making too much salt water with the oil.

It will be seen from the facts presented above that a great many other interesting oil and gas developments are to be anticipated in the near future from this district, and in fact from many parts of the County of Kent and of several of the neighboring counties.

NOTES ON THE MINERAL FUEL SUPPLY OF CANADA

By R. W. Ells, LL.D.

(Abstract of paper read before the Royal Society of Canada.)

(Continued From Page 245.)

Farther west the rocks of the mountain chain belong to an older series than those which contain the coals; but the next division westward from the vicinity of Sicamous, although for the most part igneous in character, contains isolated basins, generally of Tertiary rocks, which carry coal beds often of large extent and thickness. These are found at widely separated points, such as the upper part of the Peace River, the valley of the North Thompson, the vicinity of Kamloops, the Nicola valley, and the Tulameen and Similkameen district, all with the exception of the two first being situated to the south of the Canadian Pacific Railway; while to the north are the areas along the Marble canyon at Hat Creek, a few miles northwest of Ashcroft, and the Bulkley valley deposits farther north, situated to the south of the Skeena River. Most of these coals are of the coking variety, while the lignites are of excellent quality.

On the Pacific coast the great Cretaceous deposits on Vancouver Island have been mined for nearly half a century. Farther north, on Graham Island, which is the most northerly of the Queen Charlotte group, anthracite, high grade bituminous and lignite are found. This field promises to be of great value.

The occurrence of these several varieties of coal in rocks of practically the same geological horizon is interesting, since it is probable that at one time all these newer coals existed in the form of lignite. It has been pointed out that as we approach the foothills from the plains, and thence continue westward into the mountain range at Crow's Nest and at Banff, the percentage of water in the lignite gradually diminishes and the coal passes through lignitic coals into bituminous and thence to semi and true anthracite. The alteration of the coals is due to a large extent to heat induced by pressure during the epoch of mountain-making.

Though the change in character of the coals may also, to some extent, be due to the relative position of the seams in the section, still the difference in character does not depend entirely upon the geological horizon, since in the interior basins of British Columbia many of the Tertiary coals are highly bituminous instead of lignitic, while on Queen Charlotte Island the Cretaceous coals range from high grade bituminous to broken and shattered anthracite.

The thickness of the coal-bearing strata along the eastern side of the Rocky Mountains aggregates several thousands of feet. In a section published by Mr. J. McEvoy, the total thickness of the coal-bearing formation exposed along the Elk River amounts to 4,736 feet, and the coal seams exposed have a total thickness of 216 feet. The thickest beds in the section are 36, 46 and 46 feet respectively. Along Michel Creek, on Morrissey Creek, and near the divide between Elk and Fording Rivers, large workable seams have been found. It is evident, therefore, that the quantity of coal on the Crow's Nest basin is inexhaustible, the amount estimated by Mr. McEvoy for an area of 230 square miles, owned by the Crow's Nest Company, alone being no less than 22,595,200,000 tons.

In the Banff district, where are the Canmore and Anthracite mines, about fifteen seams have been recognized. The geological formation is Cretaceous. Beds of semi-anthracite have been opened up having thicknesses of 12 to 15 feet. These coals extend northward to the upper waters of the North Saskatchewan and Peace Rivers.

Between Crow's Nest and Banff and northward near the upper waters of the Peace River, large coal seams have been reported. So far no trace of coal has been found in sediments of Carboniferous age.

The coal areas of Vancouver Island have long furnished the Pacific coast of British Columbia and as far south as San Francisco. The coals, which occur on the east side of the Island are high grade bituminous and of Cretaceous age. The mining centres are confined to Comox, Nanaimo and Ladysmith. The seams frequently vary in thickness from three or four feet to fifteen or twenty feet.

On the mainland of British Columbia the coals are bituminous rather than lignitic, though the latter is also found both as lignite and as lignitic coal.

The Nicola coals are bituminous coals, yielding on excellent coke. These coal areas, lying about fifty miles south of Kamloops, will doubtless supply a large part of British Columbia's demand.

The high grade coking coals of the Tulameen and Similkameen districts are similarly of great importance. Good coal, both bituminous and lignitic, is found in several other districts.

Both lignite and true coals are found in Northern British Columbia, both south of the Skeena River and Northward at intervals into the territory of the Yukon. Probably the most important occurrence is on the Telkwa River in the Bulkley Valley, where five seams of coal, from 2 1-2 to 20 feet in thickness and of excellent quality, have been found near the proposed line of the Grand Trunk Pacific Railway.

In the Yukon district coals of good quality have been found. There are several seams exposed on Cliff Creek on the Klondike River, and it is estimated that an area of 200 square miles is underlaid by coal.

The Colliery Guardian, May 31st, makes the following comment on the Canadian Industrial Disputes Investigation Act of 1907: "As regards taking proceedings under the Act, it is at present left to any private individual to lay the necessary information. This, perhaps, explains why the miners of Fernie, B.C., recently went on strike even while a Board of Conciliation and Investigation was being constituted. Neither shall we know, without further experience, how far the Act will effect the purpose for which it is intended, for in the case of the Fernie strike an agreement was speedily arrived at. Both in New Zealand and New South Wales similar efforts to prevent strikes by force of law have given rise to grave constitutional difficulties."

THE GOLD MINING INDUSTRY OF NOVA SCOTIA

By E. Percy Brown, S.B.

The accompanying diagram, taken from the Report of the Department of Mines for the Province of Nova Scotia for the year 1906, is interesting as showing in a graphic way the very unsatisfactory progress of gold mining in Nova Scotia during the past forty-four years.

Many excuses have been offered for the fact that instead of a steady and healthy growth the industry has suffered severe setbacks at times, and during the past five years, when the mining industries of most countries have been booming, the gold production of Nova Scotia has steadily decreased.

One authority states that the large mines are carrying on development work only, while they are extending and enlarging their plants preparatory to increased production.

Others state that the days of the small, rich, nuggety lode with a large yield per ton, but a correspondingly large cost, are passing away and that more attention is being devoted to the low grade and larger deposits from which, though the gross yield may be less, the net return is greater.

Such excuses, though doubtless partly true and perhaps sufficient for the layman, are recognized by every mining man as but poor ways of explaining the present status of the industry.

The first discovery of gold in Nova Scotia is said to have been made at Tangier in the year 1860. There was considerable excitement over the discovery and prospectors flooded the country.

Gold was found in so many different places during the next few years that it was thought that the whole Province was auriferous.

The conditions under which mining was carried on can be realized when we read that at Tangier during the year 1860-61 no less than 100 small areas 20 by 50 feet were laid out and that as many as six hundred men were actively engaged in prospecting. It is said that during this time twelve gold-bearing lodes were opened up in this district. Many shafts were sunk on the different veins and the rich outcrops removed in any way that seemed easiest at the time without regard to the future.

This system of granting areas only 20 feet along the line of the lode initiated a system of mining in Nova Scotia which has remained almost to the present day.

Looking over the plan of Tangier gold district, as published by the Geological Survey of Canada, we find that six different shafts were sunk on one vein within a distance of 125 feet. On another lead, not more than 50 feet south of the one above mentioned, there are shown 10 shafts within a distance of 250 feet.

Tangier was by no means exceptional in this respect, for even after the size of the area had been increased to 150 by 250 feet this remained the usual system of mining in the Province.

In Montague gold district I have counted on one vein no less than seven shafts in 300 feet. In Malaga gold district on one lode 10 shafts are found in 450 feet, and on another 7 shafts in a distance of less than 350 feet.

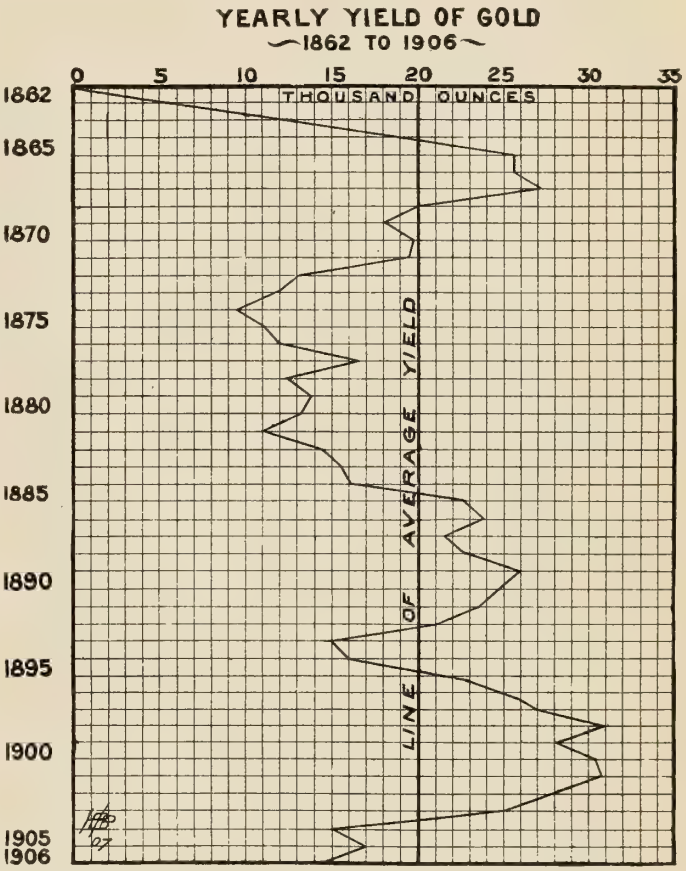
Many other instances might be given, but these will suffice.

The method of mining consisted in sinking a shaft to a depth of, say 50 feet, and stoping the ore from the grass roots down on both sides of it to such a distance that the ore could be easily shovelled to the shaft. Then two new shafts were sunk on the vein on each side of the first opening, and the operation repeated until the extent of the workings got beyond the capacity of the owners, or the supposed limit of the ore had been reached.

It is easy to see how such a system, or lack of system, would bring early disaster.

In the first place the mine would become a gutter for all the water of the region, and secondly, if the length of the outcrop were limited, the mine would speedily be condemned, as it would hardly be possible under these conditions to discover any line of "pay streak."

It speaks well for the number of rich outcrops in the Province that the production, under such circumstances, kept up as well as it did.



DIAGRAM, Showing Annual Output of Gold in Nova Scotia from 1862 to 1906.

Nor does this crooked black line in the diagram tell all the story.

Miners who have worked in some of the richest mines in Nova Scotia, have assured me that they believe that in many cases the amount of gold stolen by the miners exceeded the amount obtained by the owners.

I have every reason to believe that this is the truth; and certainly the conditions under which the mines were worked gave every opportunity for dishonesty.

The gold in the ore mined was mostly coarse and nuggety. The general belief was, as expressed by a miner, "if you can't see gold when you spit on the rock it ain't worth mining."

On the underhand stopes, when the ore was passed from one shoveller to another, usually in a stream of water, the glitter of gold would quickly catch the eye, and rich nuggets would find the pocket of the dishonest workman.

The ore was hoisted in small tubs up the humerous shafts to the surface, where it was washed and sorted, the idea of management being that the poor ore should be sorted out and go on the dump, whilst the good ore was sent to the mill. It can be seen that the "deckman" thus had as good opportunity to dishonestly increase his wages as his brother in the "pit." This matter of stealing gold became, in many districts, such a common affair that the miners began to consider they had a right to what they could find. Hence originated what was called "Miners' Rights," which was understood to mean that the men considered that what gold they saw belonged to them and what they did not see belonged to the company. Indeed, as recently as two years ago I was told that the reason why some of the men were leaving a certain mine and going to another nearby, where the pay was less, was because at the latter mine they had "Miner's Rights." Of course I do not mean to say that these so-called "Rights" were recognized by the company, but it was a matter of common talk among the men.

It may thus be seen that the Mining Society of Nova Scotia has good grounds for its agitation for the enactment of rigid laws for the suppression of gold stealing.

There is also another reason why we may justly believe that more gold has been mined than is shown by our records. No one can doubt that there has been a tremendous loss of gold by means of values escaping in the tailings from our stamp mills.

On the class of ore that we have been considering, namely, that containing nuggety gold, the loss in this way would not be large, but as the years went on another class of ore was discovered, some of which contained gold in a very fine state of division. In some cases the gold appears on the quartz or slate as though it had been laid on with a brush, in other cases where it is is hardly visible to the naked eye under a magnifying glass it resembles a springling of fine salt; and yet again, particularly where the ore, quartz or slate is heavily mineralized, the presence of gold cannot be detected except by assay or by mill test.

This class of ore is most important and deserves more attention than it has received in the past.

Two cases in particular of heavy losses in tailings from the treatment of ore of this class have come under my notice. In one case the ore contained about 2 ounces of gold per ton, and the loss of gold from the end of the plates was nearly 1 ounce per ton.

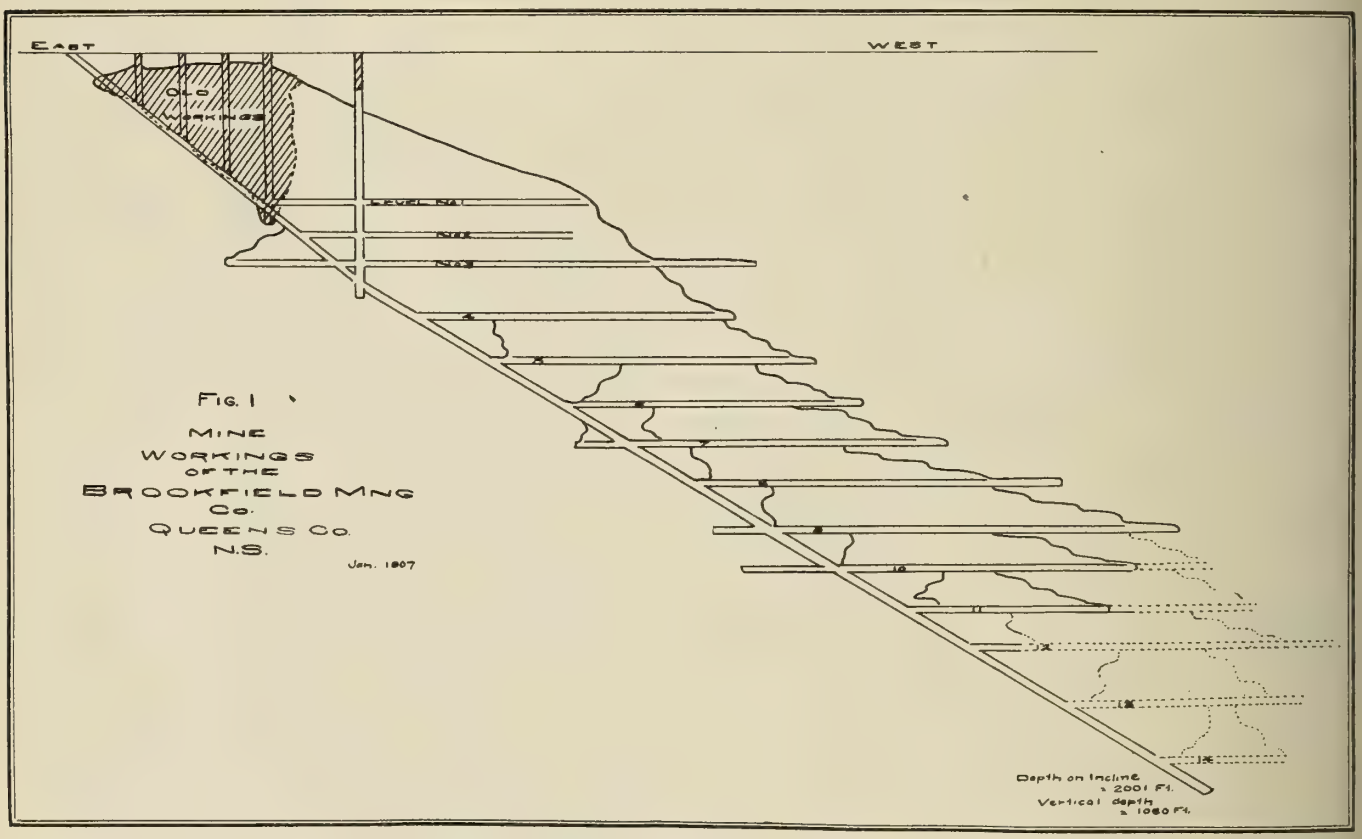


FIG. 1
MINE WORKINGS OF THE BROOKFIELD MNG CO. QUEENS CO. N.S.
Jan. 1907

Many amalgamators who read this will smile and say "impossible." That is exactly what was said by the manager of the property in whose mill this ore was treated, and he refused to be convinced until these tailings were treated chemically and a large portion of their values recovered.

In another case a company had been operating their mill for some time and obtaining what they considered satisfactory results, for they had, like the majority of gold mining companies in the Province, no means of ascertaining the amount of gold they were losing from their mill, and did not bother about finding out, as the mine was giving them a fair return on their money. However, the yield began to fall off, and dividends ceased. The manager in an inquisitive moment found some amalgam in the sluice. This combination of circumstances made him suspect that they might be losing some gold. The next month they sent a number of tons of their ore

to a neighboring mill. They were surprised to find that, whereas the ore crushed in their own mill gave them 8 dwt. per ton, the other mill returned about 12 dwt. per ton. Thinking that perhaps this difference might be due to a difference in the values of the ore treated, they repeated the test. They took great pains in arranging the distribution of the ore so that each mill should have the same grade of material to treat. The ore was a little better in this case. Their own mill gave 10 dwt. per ton and the other mill 15 dwt. They were loth to believe these results, but they seemed to warrant further investigation. They engaged an assayer to come to them for a week and take samples from the tailings of both mills. Their bewilderment increased, and they refused to believe the assayer, when he reported that even the mill which was making th better saving was losing values at the rate of 3 dwt. per ton. A cyanide plant was erected on this property later, which amply demonstrated the facts by not only paying for itself, but almost paying for the whole mine during the first year of its operation.

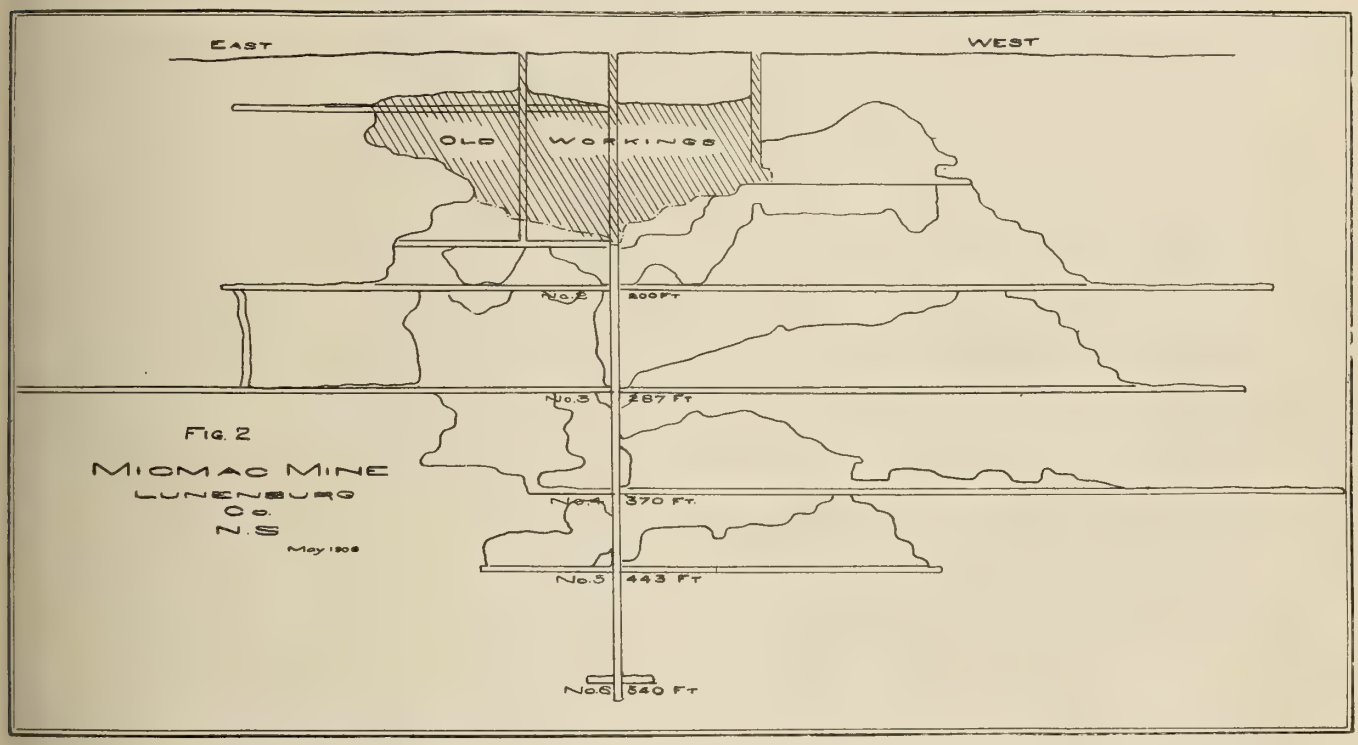


FIG. 2
MICMAC MINE
LUNENBURG
CO.
N.S
May 1908

These are but two cases. We cannot doubt that throughout the whole Province there have been many others.

The saving of the values in the concentrates by the Boston Richardson Mining Company during the past year (CANADIAN MINING JOURNAL, June 15th, 1907) furnishes an example of what would have been lost even on a low grade proposition. But all the foregoing merely tends to show how much gold has been mined and should have been recovered from the mines of Nova Scotia.

The reader may justly say: "Well now, why, with all your improved methods of mining and milling does not the yield of gold increase instead of falling off year by year?"

One authority says, lack of prospectors to find new ore bodies; another, the high price of coal; another, the gold mines of Nova Scotia are only surface deposits and have been exhausted. What our first friend says would perhaps tend to show that he believes what our friend number three says, and that it is no good trying to work the abandoned mines and that new surface deposits must be opened up.

Mr. W. H. Prest, a practical mining geologist, who has had a long experience in Nova Scotia, wrote a short article to *The Engineering and Mining Journal* some three or four years ago, in which he shows in a masterly way how very unlikely it is, from a geological point of view, that the portion of our gold veins, which happens to be exposed, at or near, the present surface of the ground, should be the limit of this pay ore.

It would indeed seem peculiar, considering the extent of erosion, which we know has taken place in this portion of the continent, if this erosion had stopped at a point just one or two hundred feet short of completely wiping out our deposits of pay ore. I do not mean to say that it is not possible that secondary enrichment may have taken place and made the surface deposits somewhat richer than the ore bodies at greater depth; but I do hold that it is unreasonable to suppose that the ore values will be lowered to such an extent as to make profitable mining impossible.

In a contribution to the Mining Society of Nova Scotia (March meeting, 1907), the writer has endeavored to explain how the continuation of an ore body may be lost and the mine abandoned, but reopened later, the ore body found and followed to a considerable depth.

The old Nova Scotian method was so peculiarly adapted to losing a pay shoot that it is a wonder any mine passed the initial stages. As a matter of fact, the existence of pay shoots has been in the past and is even today to a great extent ignored.

The following is a brief sketch of what has been the history characteristic of many of the most promising mines of Nova Scotia.

The rich outcrop of an ore body has been opened up and near the surface, and in some cases to a considerable depth, has given very satisfactory returns. The owners, probably working it themselves, and for the good of their own pockets, have endeavored to handle only such ore as would pay them to mine.

Doubtless the method of mining has been most crude

and their eyes the chief guide as to the location of pay ore. Sooner or later the water has become troublesome, and the cost of sinking new shafts and their inability to follow the pay ore as depth increased has forced them to sell to a company with larger capital. The new company at once condemned the methods and machinery of their predecessors and completely changed the scheme of development. Perhaps they sank a vertical shaft to cut underlying ore bodies and established an elaborate system of cross-cuts and levels. The mill was quadrupled in capacity and operations started on what was termed in the prospectus "a modern scale." What was the result? The "pay streak," probably small in comparison with the outlined scheme for future development, was completely lost sight of. It had been sufficient to yield the original owners a handsome profit on their work, but not worth considering, presumable, by a company with a million dollar capital.

The new company had large quantities of so-called "ore" in sight, forgetting that vein matter though it may be quartz is not necessarily "ore," and proceeded to mill it with most unsatisfactory returns. After a few months' work the mine is condemned and the gold measures of Nova Scotia get the blame once more; whereas if, instead of a 40 or 60 stamp mill, this company, content with a modest capital, had erected at first a modern ten stamp mill, they could have developed intelligently the "pay streak" of the former owners. If water powers were available, these could have been utilized, thus eliminating the bugbear of high-priced coal.

The mine thus equipped could be developed at a profit and actual "ore" blocked out until such time as an increase in milling capacity was warranted.

Mr. E. R. Faribault, of the Geological Survey of Canada, in his most excellent paper "The Gold Measures of Nova Scotia and Deep Mining," published by the Mining Society of Nova Scotia, deals mostly with one class of the gold-bearing veins of the Province. In his remarks regarding pay streaks he says: "In the interstratified veins the gold is sometimes distributed uniformly over considerable areas; usually, however, it is more or less concentrated within certain limits, leaving spaces on each side comparatively barren. These enrichments are known as pay streaks, and have hitherto been the chief source of the gold production." I think that it might be more truly said that the outcrops of these pay streaks have hitherto been the chief source of the gold production.

Mr. Faribault further says: "The pay streaks lie at right angles to the sliding movement, that is to say, approximately parallel to the anticlinal axis." I may add that the accuracy of this statement is being demonstrated more clearly every day by the work now being done by the Boston Richardson Mining Company.

For further data regarding pay streaks the reader is referred to Mr. Faribault's valuable paper.

The direction of pay streaks on the veins cutting the stratification is not so readily determined. In the case of the Libbey mine at North Brookfield, the ore shoot followed the intersection of the "fissure" with a main or interstratified vein. In other districts the pay streaks in the veins cutting the bedding appear to be governed by the nature of the strata crossed. Yet again, in other localities the occurrence of small "feeder" veins or "angulars" appears to be the cause of the enrichment.

It is most apparent that the subject should be carefully studied and accurate records kept of all data that may help to solve the problem.

As Mr. Faribault says again: "The data necessary to explain the many peculiarities in the different gold districts are difficult to obtain with any degree of precision, as few plans or records have been kept or are obtainable."

In a few cases in this Province such shoots or pay streaks have been successfully followed to considerable depths, in one case to a depth of over 2,000 feet along an incline of 35 degrees to the horizontal, or a vertical depth of 1,000 feet. In another case by means of a vertical shaft, levels and winzes to a vertical depth of one thousand feet. In these cases it was not because the ore body was any more promising or persistent than many that have been abandoned; but it was because the management possessed the necessary experience, pluck and perseverance that the mine was kept upon its feet.

Th accompanying sketches, Figures 1, 2 and 3, will illustrate how some Nova Scotian mines have been developed from the old method of working, which has been discussed previously, to a modern method of overhand stoping.

Figure 1 shows the underground workings of the mine of the Brookfield Mining Company (Libbey Mine), the development of which is described in detail in the paper previously mentioned.

This affords one of the best examples we possess of the abandonment of a mine after the rich outcrop of the pay streak has been removed. It affords also an excellent example of the manner in which such an ore shoot can be successfully followed to a considerable depth. Figure 2 shows the workings of the Mic-Mac mine, and the radical change which its system of development has undergone during the past eight years. The survey of the old workings, made by the writer in 1899, shows how the stopes had been beaten down flat. All ore was passed to the shafts by shovellers and then shovelled into small tubs to be raised to the surface.

The present workings (taken from a plan published by *The Industrial Advocate,* May, 1906) shows a system of "backstoping." Cars are used on the levels, large bins at the shaft and a self-dumping skip carries the ore to the surface.

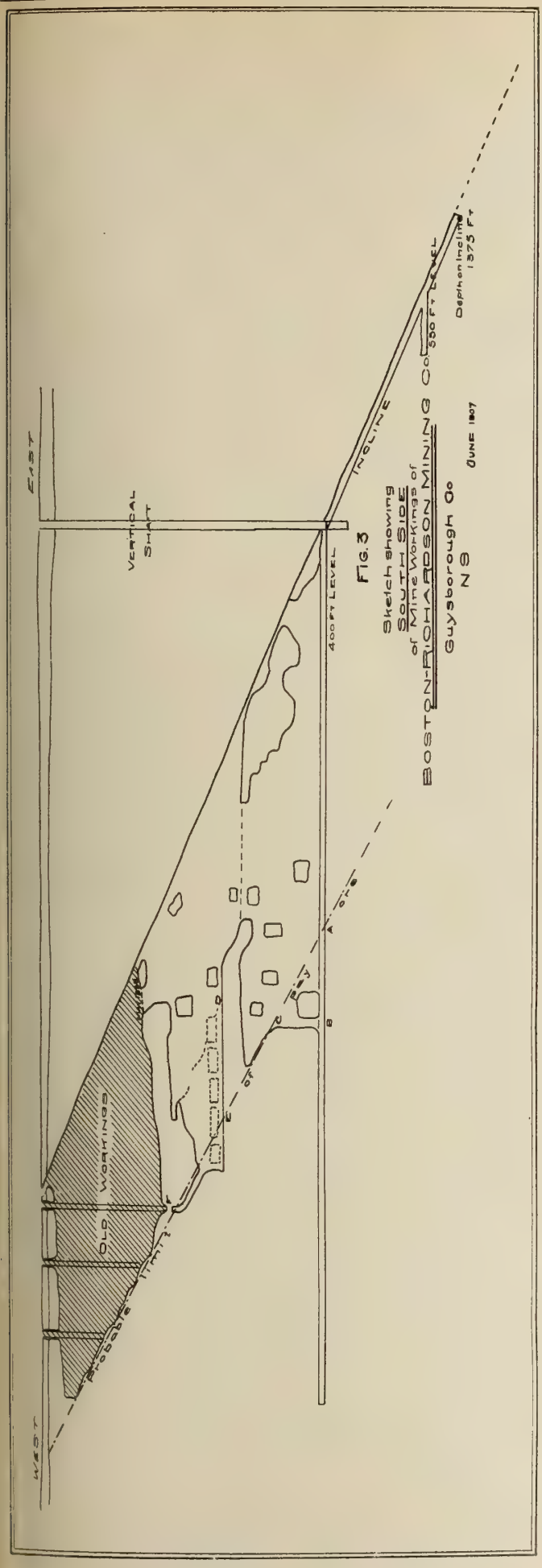
This mine is peculiar in that I understand the management claim that there is no definite "ore" shoot.

Figure 3 shows the south side of the Richardson fold and demonstrates clearly how well defined is the line of pay ore. The ore body on the north side is much larger than that on the south, and though the lines of the pay ore are well demonstrated there it does not illustrate the point so clearly as the workings shown in the figure.

The old workings were opened up in the regular way, the usual number of shafts were sunk and bottomed in the lower edge of the pay shoot, as shown. By the time this work was completed it was considered that the mine was practically done; but the Boston, Richardson Company took hold of the proposition, sank the vertical shaft as shown, struck the continuation of the dome at 400 feet, and worked westward along the legs of the belt. The south level was pushed forward until at a point, marked A on the sketch, the ore values pinched out. The level was continued westward for some distance, but the values continued low. A raise was driven upward from the point B, which entered the ore body at C and was continued along it on an incline.

Again work was started at a point, D, just below the old workings, and followed westward to E, when the values again became low. A raise was put up just beyond this point, cutting the pay shoot again, as shown. An inclined raise was then driven to tap the old works at F.

I consider that this shows, in a remarkable way, the continuity of a line of pay ore. The ore body on the



400 foot level gives every indication of being better in value than at points nearer the surface.

The Boston, Richardson Company are now developing the ore body on both sides of the apex by sinking an inclined shaft on the pitch of the dome or apex, as shown. They thus avoid the mistake of sinking through and past their ore body with a vertical shaft. As to whether the value of the ore decreases with depth can be judged from the history of the mines shown in the accompany sketches.

I am told that for the past two years the average yield per ton from the Mic-Mac Mine has been over $10 per ton, which is quite up to the average of the mine and better than the value of the ore at many places nearer the surface.

The last brick of gold from the mine of the Brookfield Mining Company was over 500 ounces, which was one of the largest in its history.

The ore of the Boston, Richardson gives every indication of becoming better with depth, and I believe that the future work of this company will give the best illustration of this point that has ever been shown in the Province of Nova Scotia.

I hold that the general disregard of pay streaks, either through losing the continuation of the same or smothering the good ore obtained from such pay streaks with thousands of tons of worthless quartz has resulted in the present idleness of so many of our mines.

It has unfortunately been the case that when a large company has started operations in the Province they have hardly ever been content to develop the mine so as to work the pay ore only. The demand has always been for tonnage. Careful sampling of the mine has been neglected, and ore from every portion of it has been put in together, so that finally, where there might have been a yield of $5 per ton with a 20 stamp mill, and a good profit, the yield has been cut down to perhaps $1 or $1.50 per ton in a 60 stamp mill and the margin of profit emilinated.

It is more difficult than it might seem to right this state of affairs. As a rule no accurate maps or other data can be obtained of the abandoned mines, so that if a man wishes to open one of them he has to go to considerable expense before knowing how to start.

But this is not all. He must first get the property, and here the chief difficulty confronts him. The company holding the mine may not, and probable do not, consider the property of any real value; but when a purchaser appears they remember what it has cost them (through their own mistakes) in the past, and hope to get their money back by selling at a high figure. The consequence is that the would-be purchaser is rightly discouraged. He sees that even if the mine should pan out as he believes probable, there would be no money in it for him. There is nothing to prevent such companies holding these mines as long as they wish to, for under the present law they have only to pay 50 cents per year for each area they wish to hold and the property remains theirs.

The attitude of such non-operators is well illustrated by the following true story:

A certain American capitalist having decided to purchase a gold mining property not a thousand miles from Isaacs Harbor, was being driven to the camp by a local man. The conversation turned to mining, and the driver confessed to being a part owner of the very property his passenger was going to visit. Without revealing his identity, the gentleman asked the driver the reason why, if his property was as good as he described it, they did

not work it themselves, whereupon the driver turned to him with a smile, the embodiment of business cunning, and said: "We are waiting for some sucker to come along."

It appears to the writer that in order to relieve the present stagnation of the mining industry a radical change must be made in the laws governing the holding of mining property. If a man has not faith enough in his property, or even if he has the faith, but cannot get the capital to demonstrate it, let some one have the property who has faith and can command the capital necessary to prove it.

The Government of this Province has shown itself willing to aid the mining industry in many ways. Let it now come forward and so help gold mining that it may be put upon a secure and permanent basis.

Some New Points in the Geology of Copper Ores

By James F. Kemp, DSc., etc., Columbia University, New York.

(Toronto Meeting, 1907.)

During the past year or two cobalt and silver have been the metals most prominently in the foreground in Ontario; but south of the national boundary and in other parts of the world, copper has occupied the centre of the stage. The growth of electrical applications and the increasing consumption of brass have made the market well-nigh insatiable. Copper mining has greatly increased, and with the growth of new districts and with widening experience, we have found it necessary to modify some of our old-time conceptions.

Twenty-five years ago, when the classes in the mining schools were taught the mineralogy of the ores of copper, it was chalcopyrite that was esteemed the principal mineral. Of course the importance of the native metal on Keweenaw point was appreciated, but we used to define an ore as "the compound of a metal and mineralizer, such as sulphur or oxygen"—and the native form, even though abundant in one locality, was thus ruled out. Experience with the lenticular beds or veins, in the slates and schists along the Appalachian belt from Sherbrooke, Quebec, to Ducktown, Tennessee, and the historic ore bodies of the Rio Tinto district in Spain, whose geological relations are similar, gave good ground for the esteem in which chalcopyrite was held. It was considered, moreover, to be the original mineral from which the others were generally believed to have been derived. Observers of those days were perfectly familiar with the oxidized zone, and with the zone of enrichment, at the level of the ground-water. At the latter horizon the Ducktown mines had taught all of us in America that rich black ores were precipitated, but the dark mineral was for many years believed to be the oxide, tenorite or melaconite, until W. H. Weed proved it to be chalcocite. Chalcocite was esteemed to be rather uncommon, and when we students saw it at all, it was chiefly in crystals from the old copper mine at Bristol, Connecticut, an enterprise that had impressed its shareholders rather by the lack of copper than by its abundance.

To-day, on the contrary, in the United States and Mexico, chalcocite furnishes much the largest part of the copper produced, and for some years to come its relative importance bids fair to increase rather than diminish. Butte, Morenci, Bisbee, Globe, and Cananea derive most of their output from it, while Bingham and Ely will soon be concentrating the glance from the porphyries on an enormous scale.

So far is chalcopyrite from being the principal and original mineral at Butte, that on the one hand it is rather uncommon and on the other it is one of the latest of the secondary minerals, since we find it in veinlets cutting covellite. Alike at Butte and in Arizona the original mineral appears to be a lean copper-bearing iron pyrite, which is then, by secondary enrichment, oxidized in one place and deprived of its copper, only to gain the latter elsewhere in the form of chalcocite, which brings the lean original up to grade.

In later years, and for a period lasting well up to the present, we have laid great and just emphasis on the processes of secondary enrichment by the descending surface waters. We believed that the new chalcocite and other minerals were deposited at the level of the ground-water and for a limited distance below it. That is, we gradually grew to recognize the necessity of a greater diffusion of the descending copper solution throughout the quiet ground-water than we had at first thought either necessary or probable. But in the issue of the *Mining and Scientific Press* for February 23rd, page 236, we learned that a cross-cut in the Berlin claim at Butte had cut a great body of glance, at 1,800 feet from the surface, and that in the Neversweat, at 2,400 feet, a similar occurrence had been noted. Even before this it was generally reported that a cross-cut from the shaft at 2,000 feet in the Speculator claim had intercepted these rich ores in a still different lode.

Various suggestions tending to reorganize our old views either have been made or may be made in consequence of these discoveries. The hillside on which the copper mines are situated at Butte rises gradually to the north from the valley of Silver Bow Creek, or more steeply to the west from the same creek at Meaderville. In the latter area, shafts are said to have found the bedrock under 600 feet of overlying loose material. Obviously, as the valley was excavated by erosion, and as the former representative of Silver Bow Creek established the low point of the ground-water upon its bed rock, the subterranean water level must have risen from this point, in the hill, roughly following the surface, but at a flatter slope. The present outcrops of the copper veins are from 500 to 700 feet above the present valley, or from 1,100 to 1,300 feet above the bed rock. To estimate the ancient level of the ground-water, we must diminish 1,100 to 1,300 by such figures as will allow for its rise, roughly parallel with the surface. Whatever assumptions we may make, horeover, regarding wall rock and vein matter removed by erosion, will operate to further raise the ground-water level. It certainly can scarcely have been lower than 800 to 1,000 feet below the collars of the present shafts. The recently discovered bonanzas are from 1,000 to 1,500 feet below this level, and according to our old ideas of the diffusion of the descending copper-bearing solutions, they must have

penetrated at least 1,000 to 1,500 feet of standing water. This seems unlikely.

On the other hand we may raise the question, could the ground-water have been so irregular in its distribution that no standing body of it intervened to stagnate the descending water? This seems unlikely. Again, is chalcocite necessarily a secondary mineral? May it not be of original deposition? Experience thus far leads us to think that the presumption of its secondary nature is well grounded.

Most reasonable of all would appear to be W. H. Weed's suggestion of secondary enrichment by uprising solutions of copper, set in action perhaps by the late rhyolite. From these no lean pyrite of primary deposition thus far observed would be too deep to escape, although solutions of oxidized copper salts, such as bring about enrichment by descending surface waters, are not what we associate with waters uprising from the depths. Mr. Weed applies his conclusions especially to the enargite at Butte, but as the glance is being found deeper and deeper, we may at least raise the question whether its lower deposits may not also have been introduced from the depths.

Ten years ago, or even less, great apprehension was felt about the persistence of ore in depth. The newly appreciated doctrines of secondary enrichment from above had emphasized and increased the misgivings, and much experience corroborated them. Rio Tinto was most often cited, where, in the San Domingo vein or lense, 4 to 5 per cent. of copper had been obtained at the surface; 2 per cent. at 260 feet; 1 1-2 to 1 1-4 per cent. at 425 feet. In the Dionisio, there was 4 per cent. at the surface; 2 per cent. at 650, and 2 1-2 per cent. at 1,500 feet. In the last citation there was a ray of comfort, but the general result was decidedly discouraging. At Butte, too, the general yield of the ores has gone down. A few years ago it was 5 to 6 per cent; now it is 3 to 4 per cent. In Arizona, 15 to 20 per cent. was not uncommon twenty years ago. The ores run 6 to 7 per cent. now, and the glance in the porphyries 3 per cent. as it goes to the mill. Improved transportation and milling processes are responsible for bringing lower and lower ores within the range of profit, and, as we must realize, there is the tendency steadily to reduce the general average; but if, at Butte, 40 per cent. ore occurs in great stopes at 1,800 feet, and 60 per cent. ore at 2,400 feet, we may raise the question as to whether the old-time generalization is as sweeping as we formerly thought.

Reverting again to the time-honored conceptions of the lenticular ore bodies or *Kieslager* of the slate and schist of the Appalachian belt and of Rio Tinto, many of us will recall that these were esteemed our typical deposits. But in later years developments in the Southwestern States, in Mexico, and in Queensland, have proved the frequent occurrence and great importance of garnet zones produced by contact metamorphism in limestone along intrusive rocks. Bisbee and Morenci, in Arizona; San Pedro, New Mexico; Aranzazu and San Jose, Mexico; Chillagoe, Queensland; and many more have shown the importance and wide distribution of this type. Garnet, vesuvianite, wollastonite, and diopside, are the associated minerals, and the ore bodies are of irregular shape. They often need secondary enrichment to bring them up to grade. They are not lenses, as are the ores at Thedford and Rio Tinto; nor veins, as at Butte; nor beds as at Mansfeld; nor impregnations of shattered rock, as at Nacosari; but are a new type when compared with our old conceptions.

One of our tendencies in earlier years was to connect ore bodies, especially of copper, with basic eruptives. Keeweenaw Point and Sudbury gave good support to these inferences. It was also natural to infer that as iron and the other bases increased in rocks, therefore copper, lead, and other metals would do the same in less degree. But recent experiences is just the opposite in the case of copper. Globe, Arizona, with its diabase, and the Nikolai and other greenstones of the northwest coast are almost the only basic ones that appear in the newer districts. On the contrary, we find quartz-bearing rocks of various kinds and more especially fairly acidic variety midway between syenite and diorite, called monzonite. Bingham, Ely, Bisbee, Morenci, Nacosari, and the granite at Butte, all afford a similar experience. The great deposits of Northern California are in rhyolite porphyries. We cannot but reflect that the acidic magmas are richest in dissolved vapors, that they probably in cooling yield relatively abundant magmatic waters; and that, being at the outset copper-bearing, the ore bodies are perhaps due to these characteristics.

But the most striking feature of the last year or two is the tendency of mines first worked for other metals to yield copper in depth. From Butte we learn that the silver mines along the Rainbow lode, in which, in the upper workings, no copper was found, are now showing as much as 3 per cent. at 1,000 feet. The old Black Rock claim, once a silver mine and a participant in the famous Black Rock-Niagara apex suit, is being revived and deepened for copper; and others are actually yielding the red metal. The Cable gold mines, farther west in Montana, now supply 3 per cent. ore to the Washoe smelter. Bingham, once a lead-silver camp, has changed to copper. From Leadville the same report has been coming for some years, that much copper was found with the unchanged sulphides in depth. At Red Mountain, where, near the surface, lead-silver was formerly the yield of the ore, now, in the 1,100 foot adit into the mountain, copper has been found. In North Carolina, some gold mines of former years have become copper mines to-day. Most striking of all, at the great Mt. Morgan gold mine of Queensland, the diamond drill, at 725 feet, has shown great bodies of copper-bearing sulphides, which now go to the furnace, as the earlier gold ores went to the mill.

We have for years known that lead above often passed into zinc below. We may perhaps now add a still deeper copper zone, when, in the uprising water that brought in the ore, copper was present with the other two. Gold above may also change to copper below, or be associated with it, and apparently not always because copper once general throughout the vein has passed downward with the atmospheric waters.

An interesting corroboration is thus afforded of views advanced by W. H. Weed in the paper already cited, of which one of the closing paragraphs is: "Ascending hot-spring waters, if metalliferous, may deposit different ores with an orderly vertical distribution. Existing veins now mined often show this arrangement of metallic sulphides."*

* Trans. Amer. Int. Min. Eng. Vol. XXXIII. p. 754, 1903.

The Department of Mines' new monograph on Canadian graphite, written and compiled by Mr. Fritz Cirkel, M.E., will be issued very shortly. We are informed that the work is of a very comprehensive nature and will form a most useful addition to the series on Canadian minerals, now being published under the auspices of the Department.

THE CONIAGAS MINE AND CONCENTRATOR

Through the courtesy of the officials of the Coniagas Mines, Limited, we are enabled to publish a plan of the underground workings and a flow-sheet showing the proposed treatment of their concentrating ore. The flow-sheet is of especial interest, as Cobalt's future will depend in a large degree upon concentrating ores. For the sake of comparison it may not be out of place to note roughly the equipment chosen for the Buffalo concentrator:—

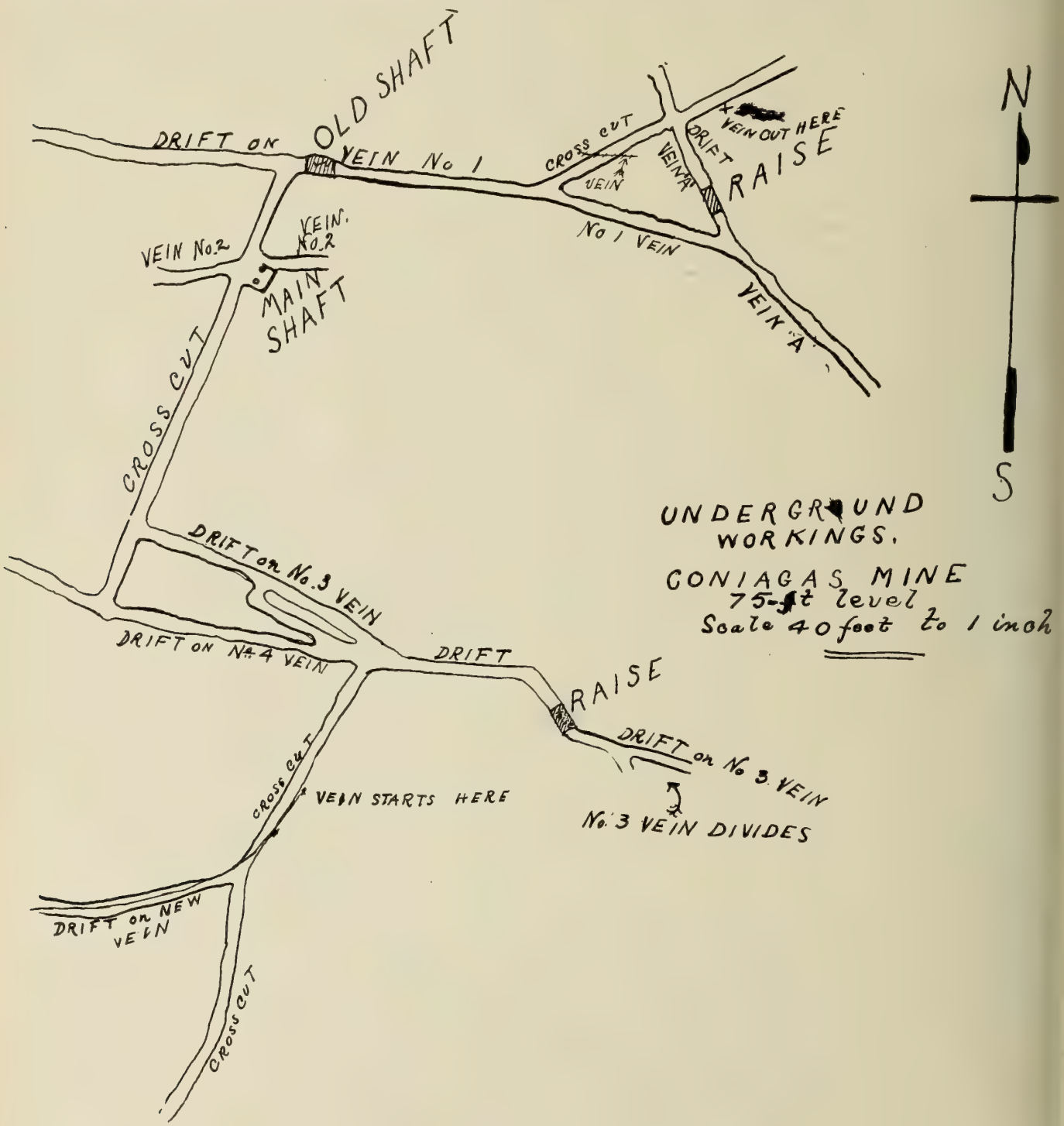
Three Blake crushers, one of which is 6 inch x 20 inch, and the other two 7 inch x 9 inch.

Two rolls, 15 inch x 20 inch, with 8 to 12 tons capacity per hour.

Two double trommels.

Two hydraulic clasisfiers.

Two jigs, one or two compartments and one of threee.



PLAN OF CONIAGAS MINE, COBALT, ONT.

One Huntingdon mill.

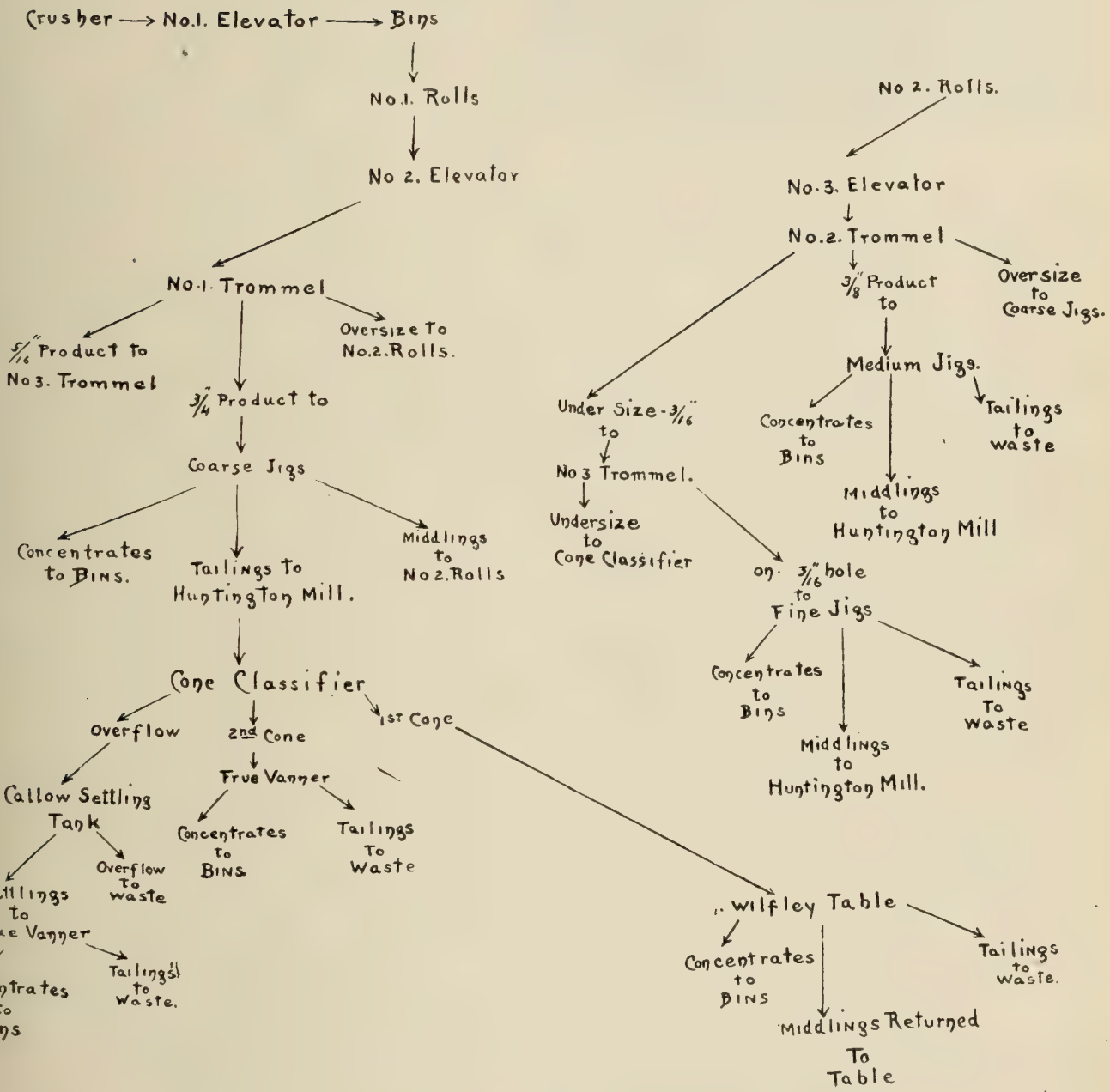
Settling tank.

Wilfley concentrating tables and Frue Vanner.

Slime tanks.

Belt elevators.

Proposed Flow Sheet.
for
The Coniagas Concentrator.





CONCENTRATOR BUILDING, CONIAGAS MINE, COBALT, ONT.

GEOLOGICAL SURVEY OF NEWFOUNDLAND

REPORT UPON THE MINERAL STATISTICS OF THE ISLAND FOR THE CALENDAR YEAR 1906

The total value of the mineral production of Newfoundland during 1906 is set at $1,462,344, an increase over 1905 of $95,051. The number of persons employed in mining during the year was 2,271. Only three fatalities occurred during 1906, a death rate per thousand of 1.31.

The following summary gives details of the mineral production:

MINERAL PRODUCTION OF NEWFOUNDLAND FOR 1906.

Antmony—Quantity raised, 100 tons; value of mineral exported, $4,050; total value of production, $4,050.

Brick—Quantity raised, 906,000 thousand; manufactured or used in Island, 906,000 thousand; total value of production, $8,260.

Building Stone—Quantity raised, 500 tons; manufactured or used in Island, 500 tons; total value of production, $750.

Cobble and Spawls—Quantity raised, 1,000 tons; manufactured or used in Island, 1,000 tons; total value of production, $1,000.

Crushed Stone—Quantity raised, 5,000 tons; manufactured or used in Island, 5,000 tons; total value of production, $5,000.

Copper Ore—Quantity raised, 75,989 tons; value of mineral exported, $360,345; total value of production, $360,345.

Gold Ore—Quantity raised, 900 tons; manufactured or used in Island, 147 ounces; value of mineral exported, $2,800; total value of production, $2,800.

Iron Ore—Quantity raised, 884,986 tons; value of mineral exported, $959,765; total value of production, $966,625.

Limestone—Quantity raised, 1,200 tons, manufactured or used in Island, 12,600 bushels; total value of production, $1,200.

Pyrite—Quantity raised, 28,132 tons; value of mineral exported, $84,396; total value of production, $84,396.

Sand and Gravel—Quantity raised, 1,000 tons; manufactured or used in Island, 1,000 bushels; total value of production, $2,500.

Slate—Quantity raised, 2,536 tons; manufactured or used in Island, 64 1-2 bushels; total value of production, $25,418.

Total value of minerals exported, $1,436,129; total value of production, $1,462,344.

Note.—Tons of 2,240 pounds.

Copper.—Exports of copper ore show a decrease of 2,731 tons, but the rise in price of metallic copper brought up the total value of the output to a figure $1,565 in excess of 1905. The Tilt Cove Mine, with an output of 66,189 tons, is the principal producer of copper ore. Prospecting for copper ore is reported to be active. Analyses of a deposit at Goose Cove, Hare Bay, gave 6.77 per cent. copper, $2.48 in gold and 57 cents in silver per ton. The Guggenheim Exploration Company has taken an option on the native copper property at Oderin Island, Placentia Bay. A New York syndicate has bonded St. Julien copper mine. The report speaks very cheerfully of the prospects of rapid development of Newfoundland's copper ore deposits.

Gold.—In May, 1906, a ten-stamp mill and a Wilfley concentrator were installed at Goldenville, near Ming's. In four months' run, at one shift per day, the mine produced gold bullion to the value of $1,500, and concentrates to a similar amount. A cyanide plant is badly needed. The deposit is of the bedded type and is composed of megnetic slate, quartz and pyrite. The lode has been traced for a mile on the company's property. It varies in width from 5 to 13 feet. A sample shipment of 23 tons was sent to the Brookfield mill in Nova Scotia. This yielded $192.72, a recovery of $8.38 per ton. Five tons of slimes carrying a total value of $55 could not be saved. Levels are now being driven east and west on the lode at a depth of 80 feet below the surface. During the sinking of the shaft frequent assays were made. At 50 to 69 feet the quartz assayed $12.60 to the ton; pyrite, concentrated from this sample, gave $50.80 to the ton. The slate mined with the quartz carries about $1.50 in gold. The values in the quartz appear to decrease in the levels. This is the first gold mine actually operated in Newfoundland.

Iron Ore.—The Bell Island mines produced more iron ore during 1906 than in any previous year. The value of the ore has advanced 10 cents per ton. Mining is now actively prosecuted during the winter. The Nova Scotia Company are driving a submarine tunnel beneath the bay, on the north side of the island to reach their ore deposits a mile from the shore. No serious difficulty has been caused by water. An English company has secured an option on the deposits of ore on the west end of Bell Island, and it is probable that they will open workings during 1907. The hematite deposits on the north side of Conception Bay are again attracting attention.

Lead Ores.—It is reported that the Messrs. Harmsworth have some miners employed at Red Indian Lake opening up a galena deposit.

Pyrite.—During 1906 the pyrite mine at Pilley's Island produced hardly more than one-half of the previous year's output. Mining charges and all costs amount to about $1.50 per ton, leaving a profit of about $4.50.

Petroleum.—The Newfoundland Petroleum Company, Limited, drilled about 3,000 feet at Parson's Pond. The

first hole was a failure. The second hole gave small quantities of oil at 1,600 feet. Drilling was suspended, owing to an accident. The official report speaks very favorably of this oil field and urges the investment of more capital.

Talc.—No talc was mined during 1906. No reason is assigned for the suspension of this industry. "Possibly the absence of sufficient capital and enterprise is what is lacking."

Platinum.—Platinum, it is stated, has been discovered in chromite near Mount Cormack. It is not in quantity sufficient to repay extraction.

Coal-boring Operations.—Boring for coal was carried on during the summer of 1906 near Goose Brook. No results of a definite character were obtained.

BOOK REVIEWS

"The Subject Matter Index of Mining, Mechanical and Metallurgical Literature for the Year 1901." Published by the North of England Institute of Mining and Mechanical Engineers. Edited by the secretary, M. Walton Brown. Newcastle-upon-Tyne. Price 42s. This admirably complete work of reference comprises a list of well-nigh 1,000 technical periodicals and other publications. The "Subject Matter" index classifies their contents for the year 1901. An index of authors is also given.

"The Journal of the Mining Society of Nova Scotia, Vol. X, being the Transactions of the Society during the year 1905-6. Edited by H. Piers. This volume presents an account of the annual and semi-annual meetings. The discussions of various matters pertaining to the coal, iron and gold industries are decidedly instructive. A series of seven papers on technical subjects follows. Among these papers is a somewhat remarkable one by W. C. Milner, entitled "Reciprocity in Coal." While it is tinged with partisan feeling, it is, nevertheless, deserving of perusal. The other papers are all of an exceedingly high order. T. T. Fulton's research report on "The Lixiviation of an Auriferous Arsenopyrite Concentrate by Cyanide" shows careful preparation and systematic work.

"Mine Timbering," by Wilton E. Sanders, Norman W. Parlee, Bernard MacDonald, and others; New York and London; Hill Publishing Company; pp. 180, illustrated. Price $2.

No branch of mining has received so small an amount of attention as mine timbering. And, perhaps, there is no subject upon which competent men hold such diametrically opposite ideas. *The Engineering and Mining Journal* has issued a book dealing with this important subject. The book is a compilation of articles that have appeared from time to time in the pages of the *Journal.* It is a valuable symposium of the practice of eminent engineers in the United States, Canada, Queensland and Tasmania. As the first serious attempt to present the whole subject of mine timbering in convenient book form, this volume deserves attention. Its value is enhanced by the consideration that in the principal mining districts of Canada the wasteful methods hitherto in vogue have made serious inroads upon the available resources. The book is the more valuable in that it gives a comparison of many different methods.

EXCHANGES

The West Australian Mining, Building and Engineering Journal for May 18th has been received.

In the *Transactions* of the Mining Institute of Scotland, at their annual general meeting at Hamilton, on April 11th, 1907, are papers on "A Stretcher for Use in Mines" and on "The Hanley Cape Guardian."

A surprising amount of useful information is to be found in the June number of *Technical Literature.* Besides the digest of current information on engineering and general science, several special articles appear, the most prominent being a description of Lehigh University.

In *The Mining Reporter,* June 20th, Otto Ruhl writes on the "Origin of Lead and Zinc Ore Bodies in Joplin, Missouri, District." The following excerpt is interesting: "An interesting feature of the process of ore deposition is found in constant reconcentration and enrichment below the level of ground water. As the degradation of the upper strata goes on, the waters in their downward course redissolve the minerals and carry them downward, re-depositing at lower levels."

In *The Mining Reporter,* June 27th, Arthur Lakes writes of the "Origin of Copper Impregnations in Sedimentary Rocks." Mr. Lakes concludes his paper with the following significant query: "Can it be possible that certain seas or other large bodies of water could locally be so charged with copper solutions, derived from some unknown sulphide source, as to be capable of being precipitated by organic or other agencies to such an extent as subsequently to form beds of workable copper ore?"

The Colliery Guardian, June 21st, in the course of its editorial comments upon the first report of the Royal Commission on Mines, notes that rescue appliances of the "pneumatogen" type develope a weakness in use. In these appliances oxygen is produced chemically by the action of carbonic acid upon alkaline peroxides. Owing to the choking of the regenerating cartridges there is a marked tendency to break down. This type, however, has the advantage of light weight. The compressed oxygen type, of which the Drager, Shamrock, Fleuss and Weg apparatus are the best known, give better results so far as the supply of oxygen is concerned. But their heavy weight is a drawback.

PERSONAL AND GENERAL

Mr. Cyril Knight, of the Ontario Geological Department, is in Toronto.

Mr. T. Hayes-Sheen was recently in Toronto on business connected with Bruce Mines.

Dr. Willett G. Miller, Provincial Geologist, has returned to Toronto from Cobalt district.

The autumn meeting of the Iron and Steel Institute will be held in Vienna on September 23rd, 24th and 25th.

Mr. O. N. Scott has returned to Toronto from a visit to the Lake of the Woods and Wabigoon districts. Mr. Scott will shortly leave again for the West.

The Hon. Mr. Cochrane, accompanied by Messrs. Monteith and Reaume, visited the various towns of the Nipissing district during the week beginning June 24th.

Mr. J. A. Bancroft, Assistant Professor of Geology at McGill University, has been retained for the summer by the Geological Survey of Canada to continue

the reconnaissance work commenced by Mr. O. E. Le Roy last year in the area along the British Pacific mainland coast.

Mr. T. W. Stiles, consulting engineer for the Canadian Mines Syndicate, Ottawa, has returned from an expedition north of Blind River. Mr. Stiles examined some copper properties in that district.

Mr. T. L. Gallagher, of the Hamilton Powder Company, who has been ill for some time, has left for the seaside. THE JOURNAL is glad to hear that Mr. Gallagher is on the high road to health and strength.

The resignation of Dr. G. C. Hoffman as assistant director, chemist and mineralogist of the Geological Survey of Canada, is announced. Dr. Hoffman has been a member of the staff of the Survey for thirty-five years.

Mr. J. W. Campbell has resigned the position of the Canadian General Electric Company's manager of contract sales to accept the managing directorship of the Alberta Portland Cement Company, Edmonton, Alberta.

THE CANADIAN MINING JOURNAL extends congratulations to Mr. Frederick Hobart, associate editor of *The Engineering and Mining Journal* of New York, on the occasion of his marriage to Miss Charlotte A. Clarke, of Brooklyn. The ceremony was performed on the 12th inst.

Mr. H. H. Claudet, the Elmore Company's representative at Rossland, has been recently engaged in installing new vacuum oil concentration plants at mines in Mexico and Colorado. Two similar plants, however, have been ordered for Canadian mines, and one will shortly be installed on a property in the Kootenay, and a second at an Ontario mine.

The season's work at the Bullion mine, formerly owned by the Consolidateed Cariboo Hydraulic Mining Company, is now well under way, Mr. J. B. Hobson, the manager, having gone up to Quesnel from Victoria to direct operations. These properties, it will be remembered, were acquired a year or so ago, after being reported on favorably by Mr. John Hays Hammond, to the Guggenheim syndicate.

Thus *The Montreal Gazette* in a recent editorial paragraph: "The Western Federation of Miners has adopted a new constitution, which pledges all members to follow the teachings of political socialism. The federation is becoming conservative. Heretofore its militant members have been noted as following the teachings of anarchism." Which remark is wholly worthy of the *Gazette*, being, if guiltless of poetry, at least strictly accurate.

British Columbia still maintains her position as the chief source of coal supply for the Puget Sound market. Thus the imports for last year show deliveries in San Francisco as follows: From British Columbia, 310,371 tons; Australia, 70,414 tons; United Kingdom, 42,457 tons; Belgium, 3,651 tons; and other countries, 934 tons. The total being 500,655 tons. All the coal shipped from British Columbia is derived from the Vancouver Island collieries at Ladysmith, Nanaimo and Cumberland respectively, and owned by Messrs. Dunsmuir & Company and the Western Fuel Company.

In an official report, the Canadian Commercial Agent at St. John's, Newfoundland, refers to alleged discoveries of very valuable deposits of copper ore on the Exploits River, in the vicinity of Red Indian Lake, accessible to the railway, and not far distant from good shipping facilities. It is very likely that the report is true, for it is a well-known fact that Newfoundland has great potentialities as a mineral-bearing area. Notwithstanding which fact, practically no prospecting on anything like systematic lines has ever been attempted, which is the more strange as the mining regulations are singularly liberal.

The satisfactorily rapid growth of our iron industry is shown in some statistics recently published, wherein the increase in theirteen years is given at about 1,200 per cent., or an average yearly increase during this period of 100 per cent. Thus in 1894 the total output was only 44,791 tons, while last year this had grown to over half a million. Conditions are such at present that we may look for a still more rapid rate of increase in the Dominion's production of iron; in fact, the 1906 returns, which were twice those of 1904, sufficiently indicate the generally improved conditions of industry and trade.

During the nine months ending March 31st, 1907, the Department of Trade and Commerce paid out the sum of $266,555 on account of bounty to producers of petroleum in Canada. For the twelve months of the fiscal year, 1906, $291,157 was disbursed by the Department for oil subsidy purposes That, however, the bounty, is not altogether effective in stimulating Canadian production to the extent of putting a stop to the importation of foreign oil is somewhat forcibly attested by the fact that in 1906 Canada imported 30,804,575 gallons of petroleum, of which ten million gallons were refined oil for illuminating purposes.

A Government bulletin recently issued contains some interesting facts relating to capital employed in manufacturing establishments in Canada, notwithstanding that the returns are not too recent, the information applying to 1905. Nevertheless they may be used as a valuable commentary on Canadian progress, showing as they do an increase of over ninety per cent. in industrial expansion in a period of five years. To our readers the fact that the increase in the capital invested in electrical and smelting interests has, next to lumbering, been proportionately greater than in any other industry, will be especially gratifying, the capital invested in smelting in 1905 appearing as $87,482,829, as compared with $10,483,112 in 1900. Oother important advances are shown in connection with electrical apparatus and supply industries, foundry and machine shop products, iron and steel, and Portland cement.

The secretary of the Canadian Mining Institute has received notice, at the the instance of Dr. Alfred C. Lane, of Lansing, Mich., vice-president and chairman of Section E of the American Association for the Advancement of Science, of a summer field meeting of this section of the society (Geology and Geography), to be held from July 3rd to 10th at Plattsburg (in the region between Lake Champlain and the Adirondacks). Several informal addresses will be delivered on subjects germane to the field excursions, and papers are expected from Professors Fairchild, Davis, Kemp. Cushing, Woodworth, Hudson and others. The region to be visited is most interesting from a geological standpoint, and Dr. Lane believes that some of the members of the Mining Institute may be glad of the opportunity to be present at the meeting, to which they are cordially invited. Additional information in respect to the meeting may be obtained either from the secretary of the Canadian Mining Institute or from Mr. F. P. Gulliver, secretary Section E, American Asociation for the Advancement of Science, Norwich, Connecticut.

An interesting address was delivered recently in London by Mr. C. F. Just, of the Canadian Emigration Office, on "The Growth of Canadian Industries." After referring to the extraordinary development of Canadian trade in the last twenty years, Mr. Just discussed the bearing which coal and iron, water power and water transportation would have upon Canada's future as a great industrial country. It was a truism, he remarked, to say that the possession of coal and iron determined the position of a nation. The distribution and the present development of these resources left no doubt as to Canada's future. The iron industry was growing and consolidating itself at present in two divisions in Nova Scotia and Ontario, while a third, on the Pacific coast, is within the possibilities of the near future. Cape Breton, with the cost of production lower than in the States (*sic*), coupled with an unique position on the Atlantic, held the alternative of oversea markets in fee. Obviously the Ontario division was and must remain important, having a great aggregation of industries concerning iron and steel, with splendid facilities for distribution by water and rail. This view was confirmed by the decision of the United Steel Trust to establish large works at Sandwich, Lake Erie.

CORRESPONDENCE

To the Editor, CANADIAN MINING JOURNAL, Toronto:

Dear Sir,—I have received your letter of yesterday, congratulating me on the first hundred pages of the General Analytical Index to the reports of the Geological Survey. As yours is only one of several such letters, I take the opportunity of asking you to make it known, through the medium of your paper, that such congratulations are entirely unmerited.

Without the help of the officers of the Geological Survey the Index could not have been brought out in its present creditable form. Every officer to whom I have applied for information has gone out of his way to assist me. But for the Survey Palæontologists—and especially Dr. Whiteaves—the fossil references would have been a mass of errors; Professor Macoun and his son have given me the benefit of their knowledge in all things pertaining to natural history. Every reference to Nova Scotia has been carefully checked by Messrs. Fletcher and Faribault; those to Labrador, by the Director; those to Quebec, by Dr. Ellis; those to glaciation, by Dr. Chalmers, and so on, and so on.

There is scarcely an officer of the Department who has not materially assisted in the work.

I can understand your surprise at my knowledge of the geography of Canada. You will not, however, be so surprised, when you learn that Mr. James White, the chief geographer, undertook to put me straight as to any locality concerning which there was the slightest doubt, and that before the proofs are signed for press he checks every geographical reference relating to Canada.

The research work necessitated by the historical references has been, as you suggest, enormous, but here again I was aided by the Assistant Librarian, Mrs. Alexander, whose intimate knowledge of the contents of the Survey library saved me weeks of arduous toil.

Yours truly,

FRANK NICOLAS,
Editor of the Publications of the
Geological Survey of Canada.

The Quebec Mining Law

To the Editor, CANADIAN MINING JOURNAL, Toronto:

Sir,—Under the above heading I find in your edition of the 15th instant a criticism which would call for certain remarks. I, however, declare at once that we have no objection to our laws being criticized; we, on the contrary, would feel happy to see them made a point for discussion, particularly in your valuable paper. We don't contend that our mining law is perfect, but it need not be so to be worth other codes of law which have given rise to so many recriminations, contestations and costs.

For the moment you refer to three points:—

1st. That the prospecting license system favors the *speculators against the man with the pick, legitimate prospectors.*

2nd. That it constitutes a temptation for the Government employes to *show favoritism in mining permits.*

3rd. That it furnishes the occasion of realizing abnormal profits.

There may be something in the first argument, but it lacks development. The prospectors are on the same footing with other people, with the difference, if any, in their favor that, being better posted on the subject, they may come first. The list of our license-holders contains a good proportion of miners. License-holders, on the other hand, would generally be approachable on good terms by the prospectors, the usual share or interests in the discoveries being allowed to them with, in addition, the funds to face the expenses, and sometimes a salary. This has been done in some instances. Could not it he hoped, then, that should the prospectors and permit-holders agree, as we believe they will, the operations would be conducted with more method, without hurry or dispute. It is not either to be forgotten that the miners are prejudiced by the practice of a different system in other countries, and they are not inclined to deal kindly or even fairly with our mining regulations. In fact, I would esteem this discrepancy to be the strongest if not the only one argument against the Quebec laws.

The second point scarcely needs attention. After a ten or twelve days' trial, in which the defence was given a free hand, not to say the lead, you mention *one* witness who *swore that he had been a victim of a clerk's mistake.* This, it should be admitted, does not amount to much, and in the same circumstances we could find as bad under any code of laws, even the Dominion one, which I consider the best under the free mines license system.

As to the third allegation, I am not in a position to say that the witness referred to has not spoken the truth. But it does not matter much whether he did or not. If he did we will know some time where the happy land is situated, when the purchaser will call at the Department; in fact it is not to be set aside that the Province remains the owner of the lands under prospecting licenses. I refer you, then, to our articles 1443, 1445 and 1456 as to the apportionment to be made out of the ground covered by a permit in such a case, between the purchaser and the Department.

Another reply would be that large profits are often derived from mining speculations in any country, whatever its laws.

Believe, me, sir, your most obedient servant,

S. DUFAULT,
Deputy Minister Colonization, Mines and Fisheries.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay, July 2, 1907.—Following on the drawbacks to shipping experienced in Cape Breton during the month of May, the shipping department of the Dominion Coal Company have been making exceptional efforts during the month of June to overtake their St. Lawrence requirements, and they have succeeded in breaking all their previous records. During the week ending 29th June 65,342 tons were sent to Montreal. The best previous showing for one week was 57,515 tons. The whole 65,000 tons, with the exception of about 2,000 tons shipped at Louisburg, was loaded at the International piers in Sydney, and in one day—the 28th—the piers handled 16,500 tons of coal. There are not many places where shipments are made with such despatch and in such quantity as at Sydney. The success of the Coal Company in this matter is largely due to the specialized type of self-trimming collier which their St. Lawrence trade has evolved. In addition to the "Christian Knudson," the pioneer ship of this class, the company have chartered four others of the same type, namely, the "Borgestad," "Fritzoe," "Fornebo" and the "Kronprinz Olav," of them being 7,000 tons deadweight and 6.500 tons coal cargo capacity. These huge colliers are not things of beauty, and with their tall funnels aft, and their bristling array of derrick posts, look something like a centipede on its back, but as coal carriers they are a distinct success. A shipment of 65,000 tons in one week is pretty good, but the Dominion Coal Company's officials do not regard this as the limit of their powers, and they hope for still better things.

Springhill, N.S.—The Board of Conciliation in the dispute between the Springhill management and workmen on the local stone question met for a final hearing of evidence on the 3rd July. Much was said on both sides of the question, but little added to the former evidence. The award has not been made public at this writing.

The Grand Secretary of the Provincial Workingmen's Association and many of the best thinking men are heartily in favor of this method of settling disputes and will willingly abide by the award. It is to be hoped this feeling is general among the men. The arbitrators are men of unquestioned ability and integrity, and their finding should certainly stand. The manner in which Judge Graham, as chairman of the Board, handled the undisciplined opposing forces showed that he at least was no novice at the work. Mr. Archibald, C.E., is also experienced in matters of the kind, and by his calm, gentlemanly deportment won golden opinions from both parties. Mr. R. B. Murray, the representative of the man on the Board, showed up well throughout the investigation, but was rather arbitrary when fixing the award.

The collieries are working steadily, though a number of the men are not. The holiday season has much to do with this loss of time.

Manager Hargreaves leaves for a visit to England on the 19th of July. He will visit several of the Durham collieries while there.

ONTARIO.

Bruce Mines, Ont.—The Copper Mining & Smelting Company of Ontario, Limited, property at Bruce Mines, Ontario, is greatly favored by nature. It extends for four miles along the northern shore of Lake Huron and the mineral rights cover some five miles in depth, it being composed of the two locations known as Keating and Cuthbertson, now shown on the map as Plummer Additional. The Soo and Minneapolis branch of the C. P. R. traverses the property from east to west, whilst the embrionic Bruce Mines & Algoma Railway renders the same service from south to north.

The locations were made in 1846 and titles were granted by the Crown in 1854. From 1848 to 1872 Bruce Mines were known far and near as being the most populated and well-to-do town on the north shore of Lake Huron. Sault Ste. Marie was still a struggling village, with its great waterway without a thousandth part of its present marvellous procession of steamers forever ascending and descending from the Lake Superior ports. From 1872 to 1875 the price of copper was down to eight cents, and no development work was done, the mine being gutted with the usual sequel, a "cave-in" on a Saturday night, so that fortunately no lives were lost.

Estimates made by measurement of the excavations show that some 400,000 tons of ore were mined in this period, and close upon 50,000 tons of concentrates, averaging 20 per cent., were shipped to England, where they produced about $3,300,000.

From 1876 to 1898 the property lay dormant and was then purchased by a syndicate and the water pumped out from two sections so as to allow examination by mining engineers. Their reports being satisfactory, a company was formed in England and a large sum of money expended, principally on the surface. A fire took place and several other circumstances arising again, the place, when on the eve of showing its value, was shut down and work was not resumed until last year, when the workings were once more unwatered, and we are now at the point when we hope to reap the benefit of our work. Needless to say that if so much had not been done for us we would not be in the position we are to-day, just thirteen months after pumping started, and the extent of the workings reopened may be better estimated by the fact that we raised 27,000,000 gallons of water.

We have now about 14,000 tons of ore on the surface or lying in the stopes ready for hoisting, and we have not neglected development work, as our plans show some 30,000 tons of ore available for stoping, and by the end of this year we expect to augment this by another 40,000 tons.

The concentrating mill which we inherited was built by our immediate predecessors with a capacity of 400 tons per day. The process arranged is that after delivering the ore at the mill, distant 1 1-4 miles from the section of the mine we are working, to which the cars are taken by rail (standard gauge), they are hauled up a trestle by a specially designed cable hoist, the ore is crushed in a Gates crushed to 1 1-2 inch, then elevated and delivered by a Robins belt conveyor to the bins. It passes to the 30 inch x 10 inch rolls and is elevated to the sizing trommels, from thence to twelve Hartz jigs of three compartments. All the overflow or "chats" are returned to fine rolls and thence to another series of twelve Hartz jigs, afterwards passing to twelve Frue Vanners with 6 feet belts, the coarser particles being again crushed by a Bryan 6 foot mill and a pair of fine rolls, and the product fed at present to three double deck 14 foot concave buddles, finishing up on another series of six Frue Vanners.

We are now daily expecting delivery of a trial unit of the new Vacuum Process which is being manufactured for us in Canada. This is calculated to treat 40 tons a day, and as the preliminary tests made on our ores have shown a recovery of from 80 to 93.5 per cent., we hope to achieve a great economy, and in that case we shall remove the buddles and put in a complete installation of the Vacuum plant, our reason for doing this being that we have ascertained by measurement that we have some 120,000 tons of tailings left on the premises by the old-time workers, and as the average assay is about 1 per cent., if we only effect a saving of 80 per cent. of the contents we consider that a handsome dividend will result. Not only shall be reduce the usual percentage of loss occurring in all concentrating propositions, but we shall have a product which we propose to utilize in the manufacture of artificial stone for house building, street flagging, kerbstone and channels, etc.

With regard to the future, everything appears very promising. Negotiations are understood to be well under way for the extension of the Bruce Mines & Algoma Railway from its present terminus at Rock Lake, distant some 14 miles from Bruce, to a point on the main line of the C. P. R., and this with a view to a further extension north to meet the GrandTrunk Pacific. As a mineral field this road opens up great possibilities. Those few explorers who have been through this region assert confidently that copper and iron, both hematite and magnetite, merely await the advent of a road offering a cheap and speedy transport to a good harbor, which Bruce possesses. It is well sheltered and a lighthouse has just been erected by the Dominion Government, rendering the entrance perfectly safe, with the additional advantages of opening earlier and closing later than the ports on Lake Superior.

Again, this road is proposed to be operated by electricity, the splendid water powers on the Mississauga River being available at a minimum of cost. It is suggested that after utilizing such power as is required by the railway the surplus will be available for distribution and sale to all the countless enterprises which will spring up in the wake of this undertaking, and there seems to be no reason why the problem of electrical smelting will be amongst the least important.

The reopening of this old, historic mining centre has led to numberless properties, and also to various smelting propositions, being brought forward. Perhaps a word of warning to the investing public might be given as regards the latter, and the caution that we are adopting in not erecting a smelter of our own until such time as our development authorizes it might perhaps be adopted with advantage by those who are looking to mere prospects as a source of a steady supply of ore.

H. J. Carnegie Williams.

Bruce Mines, 6th July, 1907.

Wabigoon, July 5th.—It is reported from Wabigoon that the Laurentian stamp mill will operate only during the day shift. Scarcity of fuel has caused a temporary suspension of night shift work. A group of Toledo, Ohio, capitalists are working claims in the Manitou district.

Iron Bridge, July 8th.—A Toronto syndicate has established a camp on a copper property near Iron Bridge. This season will see active development of the properties. Superintendent J. Cassan is in charge, under the direction of Mr. O. N. Scott, Mining Engineer. There are several outcrops of chalcopyrite. The veins are traceable for some hundreds of feet. Stripping and prospecting are being pushed energetically.

Montreal River, Elk Lake P.O., July 1st.—On Downey's claims in the Township of James a four inch silver vein was discovered some days ago. Inspector Irwin, in looking over one of the claims, scratched up a piece of the vein. It has not yet been determined how extensively the silver is deposited in the vein. In two of the adjoining townships, Smyth to the north and Tudhope to the east, there is silver also. Your correspondent saw a vein about 1 1-4 inches wide, solid silver for about 18 inches in length, up in Smyth the other day. So far as is known, the silver seems to occurr in quartz veins in the diabase, a rather different occurrence from that of the Cobalt district. It is, of course, impossible to say how rich the district will be; but the indications at present seem to point to a considerable amount of silver. The whole country up here is staked out, and most of it recorded. At Bear Creek there is a population of about 150 to 200 persons, and a post-office has just been established. There are steam and gasoline boats running up from Latchford to here. There are two intervening rapids, namely, Pork Rapids and Mountain chute, which are impassable. Thus three boats are necessary.

The newspaper reports of the fires were largely exaggerated. Considerable country was burned over, no doubt, but there is no timber up here to be burned. The beast timber is the jack pine. There is very little spruce, and almost no red or white pine.

Cobalt, July 8th.—A miners' meeting is called for to-day. The situation is becoming grave and a general strike is feared. The companies have made decided concessions, and public sympathy will hardly be with the miners. Among the miners' demands is one for three shifts of eight hours each. The companies' schedule of wages was posted up on the 6th inst. It is as follows:—

"We, the undersigned mining companies, have agreed to the following scale of wages, to take effect at 7 o'clock Monday morning, July 8th, 1907:—Surface—Surface boss, $3.25 per day; carpenter boss, $3.25 per day; carpenter helper, $2.50; machinists, $3.25; pipe fitters, $3; head blacksmith, $3.75; blacksmith's helper, $3.25; other blacksmith's helpers, $2.50; engineers, 30 cents per hour; firemen, 25 cents per hour; head ore sorter, $2.75 per day; ore sorters, $2.75; head miner, $2.75; teamsters, $2.50; hoist man, $2.75; cage or bucket tender, $3.25; other surface labor, $2.25.

Underground—Timbermen, $3.25; machine men, $3.25; helpers, $2.75; cage or bucket tenders, $2.50; other underground labor, $2.50.

Board charges at the rate of $4.20 per week, or 60 cents for every day. A working day shall consist of 10 shifts, except Saturday, when total time shall be 16 hours, nine-hour day shift and seven-hour night shift, twenty-five cents extra per day to be paid machine men and helpers sinking in wet shaft.

THE CHEMICAL SOCIETY VISITS COBALT.

Q.—What is calcite? A.—It is an arsenide of silver.

Q.—Do they blast the rock or drill it? (Answer not recorded.)

Q.—Do you think the shaft house is the air receiver?

Q.—Are the veins on the Coniagas smaltite?

Statements by Members:—(1) I am interested in argentite because it is so much like nickel. (2) Compressed air is used for the purpose of making the mines nice and cool to work in. (3) A fault plane is a joint plane, because the stratified rocks here have no bedding and the dip could belong only to a joint plane. I am interested in seeing the vein end at a joint plane.

Final Query—Are the drifts run on a regular grade so that the water can drain out?

Your correspondent submits these queries to the general mining public and to the Cobalt fraternity in particular. The culpable ignorance of men who use compressed air merely to actuate silly drills is no longer excusable. The matter of the Coniagas veins must be settled at once, and a thorough invesigation should be undertaken to ascertain whether at the producing mines the shaft houses are bing properly used. There are, of course, certain types of receivers to which Cobalt concerns have a painful aversion.

In answer to Query No. 2, your correspondent is sure that the rock is blasted. Mere drilling could not, in his opinion at least, account for the interchange of courtesies between the Cobalt Lake Mining Company and the railroad contractors on the other side of the lake.

Is it possible that hitherto respected members of our community have sought argentite for reasons other than its resemblance to nickel? And how many drifts have been so laid out that the drainage water is given a chance to escape? These are pointed questions. Can Cobalt miners answer them?

MINING NEWS

NOVA SCOTIA.

Glace Bay, July 2nd.—The new bankhead at Reserve is in operation to-day and coal is being hoisted from the French slope and the Emory. A temporary suspension has been caused at the East Slope by the failure of the concrete pulley supports.

Sydney Mines.—The work of production at the blast furnaces and open hearts of the Nova Scotia Steel & Coal Company has so far this month exceeded all previous records since the works were established three years ago. The immense orders constantly coming in and the excellent quality of the output has necessitated the officials increasing their staff of skilled mechanics, and the month of June will go down in record as the best ever experienced by these two branches of the above company.

As in the blast furnaces and open hearths, so also in the different collieries of the company—increasing outputs and the installation of men and modern machinery. The latest acquisition to the colliery department was the putting in of an endless haulage system in No. 5 colliery, a system which will hereafter do away with horses in this particular mine for underground work, and will mean an output double that which has heretofore been awarded the company from No. 5.

The work of laying the two and a quarter miles of railway from No. 3 to the company immensely rich coal seams at No. 4 has been begun by Contractor Sutherland, who has a large crowd of men at work, rushing the work of construction, and with this addition to the company's plant the directors look forward to a much larger amount on the right side of the ledger than the handsome balance shown for 1906.

It is expected that the Sydney Foundry Company will establish works in Glace Bay. About 150 men will be employed.

Stellarton.—General Manager C. J. Coll, of the Acadia Coal Company, has given orders that all employes of the company will stop work on Saturday at 2 p.m. during the summer months.

Pictou.—The suit of Barlett versus the Nova Scotia Steel Company was settled, on June 21st, in favor of the plaintiff. The plaintiff was restored the title to the mining leases under dispute and awarded $2,250 for damages and costs.

The Dominion Mining & Smelting Company's copper smelters is being kept busy. The management is hopeful of solving the problem of constant ore supplies.

Glace Bay.—The Dominion Iron & Steel Company are putting in slopes at the head of Lingan Bay, between Bridgeport and Lingan Road.

Port Morien.—The North Atlantic Collieries Company are negotiating for the acquisiton of about twenty square miles of coal areas held by J. R. Cowans, of Springhill. The areas adjoin the Gowrie and Blockhouse properties at Port Morien.

Halifax, July 5th.—The enormous loading pier of the Dominion Iron & Steel Company at Bell Island Iron Mine, Wabana, Newfoundland, was destroyed by fire to-day. The pier ran out 200 feet from the shore. In its superstructure was machinery for operating the loading plant. About 5,000 tons of ore were lost, some thousands of tons of coal, and all the machinery. This conflagration, although not entailing a very heavy financial loss, will cause a great deal of delay and embarrassment. It is possible that the Nova Scotia Steel & Coal Company's pier, which is quite nearby, will be put at the disposal of the Dominion people during reconstruction.

ONTARIO.

Cobalt.—The Silver Queen Mining Company is considering the advisability of erecting a smelter to treat its own ores.

The new centrifual pump on the McKinley-Darragh copper dam was started working on June 29th. The erection of the dam is under the supervision of Mr. H. D. Sims, of Niagara Falls. When the water is pumped out of the McKinley-Darragh's corner of Cobalt Lake it is expected that a considerable quantity of fairly rich gravel will be bagged and shipped. The McKinley-Darragh people are still open-cutting on No. 7 vein. This vein shows good value sin silver and niccolite. It is about 7 inches wide.

A new spur line from Boston station on the T. & N. O. Railway to Larder Lake, 19 miles, is now under construction. The road also being built between Townstown and Windigo will be extended to Larder Lake.

Cobalt, July 5th.—The strike of the miners in the Nipissing, it is understood, is a strike of individuals and has not received the sanction of the Western Federation of Mine Workers. On July 2nd the men waited on Manger T. R. Drummond to submit a schedule of wages. Mr. Drummond promised to answer before July 7th. However, 300 out of 380 men quit work. Meanwhile, on July 4th, 165 men returned to work, and now men are being rapidly secured. On June 3rd the mine managers held a meeting and decided to adopt a uniform scale of wages.

The Nancy-Helen and Cobalt Lake compressor plants, hoists and dynamos are now in full operation. The Nancy-Helen is about to ship three cars of ore. The Cobalt Lake has three or more cars of ore on hand, but will not begin shipping until regular shipments can be guaranteed.

Sudbury.—At a meeting of the Nipissing Copper & Silver Company, held at Sturgeon Falls, it was decided to proceed at once with the development of the properties recently acquired. Mr. T. Baycroft, of Sudbury, was appointed mine manager. The company decided further to expend $50,000 in opening its properties.

Port Arthur.—R. J. Anderson, of Minneapolis, purchased from J. W. Andrews a lead property in Dorion Township. The property covers 316 acres. Mr. Anderson has put a gang of men to work and has announced his intention of putting up a smelter.

The Tip-Top copper mine, which has been worked for some years, has been shut down temporarily. The machinery now at the mine was transported in the winter. A large portion of the smelting plant lies at Kaskabowie, where it was unloaded from the Canadian Northern more than two months ago. It is stated that this plant was ordered under the idea that the Ontario Government would build a wagon road from the railroad to the mine. As a matter of fact, the Government did appropriate $3,000. The sum asked for was $6,000. When the Government was informed that its appropriation was insufficient it cancelled the whole amount and dropped the matter. The Tip-Top mine is a promising property. It has a large amount of ore, mining from 4 per cen. to 6 per cent. copper, already blocked out. A great deal of money has been spent upon it. The Government is expected to come to its help in the matter of road construction at least.

Considerable excitement was aroused here by the finding of a fine sample of gold-bearing quarz on Mackeys or the old Menzie Island. Free gold is also said to have been discovered in that vicinity.

The lack of a Government assay office at Port Arthur is keenly felt. The surrounding districts are being prospected. But calamitous effects often follow the delay and trouble in securing assay returns.

The Deloro Mining & Reduction Company, of Deloro, Ont., successors to the Canadian Goldfields, Limited, will soon have their new plant for the treatment of cobalt and other arsenical ores in operation. This company is in excellent shape for handling arsenical ore of all kinds, being fully equipped for the treatment of mispickel ore, which they have been working for a number of years very successfully. The new plant when in full operation will afford great relief to shippers of cobalt ore. Its capacity is from 10 to 20 tons per day, and it is the intention of the company to largely increase this. The editor of THE CANADIAN MINING JOURNAL expects to be in a position to more fully describe this plant in the next issue of THE CANADIAN MINING JOURNAL.

ALBERTA.

The International Coal & Coke Company, of Coleman, Alta., has announced its intention of putting on a double shift. This will have the effect of almost doubling the capacity of the Coleman mine. The output will approximate 2,800 tons per day, and will mean the employment of about 550 men.

The Alberta Coal & Coke Company, whose property is two miles east of Lundbeck, began shipping coal in the latter part of June. They are raising about 400 tons of domestic coal per day. Southern British Columbia and the State of Washington will be their market. The company contemplate the erection of a plant capable of handling 6,000 tons per day.

YUKON.

Dawson, Y. T., June 27.—Records in the gold commisisoner's office show the biggest placer merger the world has ever known has been perfected in Dawson, whereby the Guggenheim interests have taken over properties from the A. N. C. Treadgold, Northwest, Hydraulic Company, and Yukon Consolidated Goldfields Company, and other smaller concerns.

By the deal the Guggenheim people have absorbed all the placer properties in Klondike watershed, which have been worked by the old methods. Hundreds of claims—El Dorado, Bonanza, Hunker, Bear and their rich hillsides and tributaries—are included in the deal. It is estimated that the claims have cost the company ten million dollars, and five million dollars already has been spent for equipment.

It is said that the outlay for the equipment of the Guggenheim properties in the Yukon will represent the large sum of five million dollars. Nor does this seem an over-estimate, having regard to the extent of the area the syndicate has secured for operation. The syndicate recently paid to large holders of property a sum aggregating ten million dollars for their rights. The work meanwhile of constructing a hydro-electric plant on Little Twelve Mile River, for the purpose of supplying power for the dredges and the excavation of the big ditch, is proceeding rapidly, and it is expected that three steam shovels will be shortly in place for the expedition of excavation operations.

In all some nine or ten dredges will be operated in the Territory this season, these including three by the Guggenheim syndicate; the Canadian Klondike Mining Company's electrically driven dredge on the Boyle concession; the Lewes River Company's dredge; the Bonanza Basin Company's dredge at the mouth of Klondike River, and the Ogilvie Company's dredge on Klondike River; the Forty Mile Dredging Company's dredge on Forty Mile River; while another dredge will also be operated in this neighborhood.

BRITISH COLUMBIA.

It is repored that the Guggenheims have bonded the Big Interior mine in the Alberni district.

No. 4 Slope of the Comox coal mine has been sealed up. Water is being pumped from the remaining portions of the mine.

Victoria.—The Lenora copper mine, first opened in 1899, but for three years idle, is to be reopened by the Vancouver Copper Company. The working capital of the company is $150,000. The Vancouver Copper Company was formed in London, England, early this year. Shares to the number of 85,000, at a par value of $5, have been placed on the market.

Rossland.—Rich strikes of native gold are reported on the 7 inch and 11 inch levels of the Centre Star. Similar reports come from other mines operated by the Canadian Consolidated. No official confirmation of these statements has been received.

John Levcovig, skip tender at the White Bear, fell from the 300 foot level to the 1,000 foot level and was instantly killed.

General Manager Jay P. Graves of the Granby Consolidated Company, announces that plans are now under way for an increase of another 1,000 tons in smelter capacity at Great Falls, B.C. This will give the Granby smelter a daily ore capacity of 4,000 tons, but it will require a year to complete the improvements and additions. The additions will be paid for out of earnings.

Boundary.—At the Cariboo-McKinney ten stamps are in commission. It is estimated that a year's supply of ore is in sight.

The Dominion Copper Company's Idaho mine is shipping steadily. The large double drum hoisting engine, installed last winter, is being used to good purpose.

Mr. L. H. Moffatt, of Rossland, manager of the Rathmullen Mines, Limited, is opening a large copper ore ledge on the Greyhound mine, Deadwood Camp.

At the Diamond Fraction and Texas mine, near Greenwood, an electric hoist has been installed.

For the first time in its history, the British Columbia Copper Company of Greenwood has all three of its furnaces running. This means the reduction of about 2,000 tons of copper ore in 24 hours.

The Golconda group of claims in South Deadwood Camp is being opened up by Alex. Robinson.

Achilles J. Rainville, foreman of he Eureka mine, near Nelson, B.C., fell into the water 20 feet below the 150 foot level. The exhaust steam from the pump had so heated the water that the unfortunate man was fatally scalded.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

A conference of miners' organizations was held in London last month to consider a line of action for raising the standard of wages in the different districts. The standard wages paid at the present time is the standard fixed over twenty years ago, and it is contended is now below the level of a living wage. In the English Federation districts the fixed maximum is 37 1-2 above the standard, and the present wage 50 per cent. above the standard. When in December last an effort was made to arrange for a new agreement, the owners resisted any change in the wage basis, on the ground that it was a long established basis and thoroughly understood by the employes. Certain concessions were, however, made by the coal owners. The position, therefore, is that while the men are unanimously agreed as to the policy of raising the existing wage by 30 per cent., the larger number of men employed are working under signed agreements which have two years and a half to run. Notwithstanding the new wage basis wished for is below the present minimum wage, and therefore would not disturb existing contracts, a resolution was finally passed recommending that each district shall approach the employers with a view of securing a new wage standard on a basis of not less than 30 per cent. of the present percentages upon which all future advances of wages shall be calculated.

UNITED STATES.

A consular report states that cobalt has been found in quantity in Grant County, Oregon.

Seven men were killed and two badly injured by two explosions in the Johnson mine at Priceburg, Pa., on June 18th. The first explosion was caused by the carelessness of a door tender. The second was a fire-damp explosion.

The United States geological experiments in the treatment of the black sands found on the Pacific coast are said to have been successful in demonstrating that platinum, besides other valuable minerals, may be readily and profitably recovered therefrom. There are large areas of black sand deposits on the west coast of Vancouver Island, from which from time to time gold has been extracted in paying quantities.

The United States Geological Survey proposes to establish an experimental station with a view to testing explosives used in coal

mining. The establishment will include an explosive gallery, rescue room, observation house, lamp testing room and explosives laboratory. Tests will be made by the pendulum and the trazl methods.

The production of coal in the United States in 1906 was 369,678,200 tons, valued at $512,610,744, and an increase of 5.4 per. cent. in quantity and 7.5 per cent. in value over the returns for the preceding year. Pennsylvania, of course, continues to occupy the first place in point of tonnage output, the contribution of this State being 48.4 per cent. of the country's total production. The second coal-producing State of the Union is now West Virginia, which has supplanted Illinois in this respect.

According to a report from Tacoma, Wash., the Tacoma Tin Smelting Hydraulic Company has arranged to secure necessary capital for the equipment and operation of its properties in the Clarence and other districts southwest of Nome, by giving a mortgage thereon to the Milwaukee Trust Company, of Milwaukee, to secure a $5,000,000 bond issue. Reference to this tin deposit has been made on more than one occasion by the United States Geological Survey, and there can be no doubt that the prospects for successful working are promising.

SOUTH AFRICA.

A correspondent writing to *The Colliery Guardian* describes in a very interesting manner existing labor conditions on the Rand. There is still, he remarks, a considerable shortage of cheap mine labor, although the situation has been greatly relieved by the importation of Chinese, who are paid by contract at the rate of a halfpenny an inch in the stopes, with a bonus of threepence on 36 inches, another of twopence on 48 inches and a third bonus of threepence on 73 inches, the 1-2d. an inch running all through. Unfortunately, however, the Chinese do not usually do more than 36 inches a day, as they are satisfied to earn just sufficient to provide themselves with opium and tobacco. This statement will not sound convincing to our Western readers, whose experience of Chinese is that they are indefatigable workers with the one main object in view of earning sufficient money to allow them to return to their own country on a compeence. But the explanation may be that the South African cooley is of an even lower type than his fellow-countryman in Canada.

AUSTRALIA.

Canada has still some distance to go before rivalling Australia's record as a mineral-producing country. If, however, gold be excluded our showing is quie comparable; but Australia continues to produce gold to the value annually of twice that of all other minerals combined. Thus last year the Commonwealth's mineral output, exclusive of gold, was valued at £12,149,405, or rather less than that of Canada, which in round figures, gold also being excluded, was $68,000,000, or perhaps £14,000,000. Our gold yield reached a value of $12,000,000 only, while Australia in the last two years has contributed £30,000,000 worth of the mineral to the world's supply.

Referring to the rather slow progress of the zinc industry at Broken Hill, an Australian paper remarks:—

At present there are five wet processes on the field—the Potter, Delphat, Cattermole, De Bavay, and Elmore, with the Gillies adoption of the Potter process to swell the total. So far, except at the Broken Hill Proprietary mine, where the Delprat process is worked, production is not on a large scale. The Cattermole process is understood to be giving satisfactory results at the Sulphide Corporation works and at the Zinc Corporation plant at the British mine, and the De Bavay process is said to be doing well at the North mine. It is clear, however, that expectations as to the rapidity with which the vast heaps of tailings were to be turned to account have been far from realized. All the talk of the profits that were to come, not only from the zinc recovered, but also from the associated lead and silver, have so far not been realized. The story that the Proprietary company were netting 40s. per ton on each ton of tails treated, therefore, is now relegated to the position it ought always to have occupied in the realms of fancy. Of course, with so many experimenters at work, advances in methods of treatment are being made, but that is about the best that can be said at the moment.

According to the official report recently issued, last year was one of exceptional activity and prosperity in the metalliferous mining industry in New South Wales, production having increased to the extent of 15 per cent. or £1,083,731 greater value than that of the 1905 production. At the same time this increase was very largely due to the rise in metal values, although an increased production is shown in copper and zinc. One interesting item in the return is in respect to precious stone output, the State having produced diamonds to the value of £2,120 and opals to the value of £56,000.

COMPANY NOTES

The bond issue of the International Coal & Coke Company, listed on the Toronto Stock Exchange, is $300,000, iinstead of $3,000,000, as reported. The capital stock of $3,000 is divided into one dollar shares.

The directors of the Mond Nickel Company, Limited, recommend for the year to April 30th a dividend of 12 1-2 per cent. on the ordinary shares, and a dividend of 33 per cent. on the deferred shares, placing £20,000 to reserve, carrying forward £18341. For 1905-6 the ordinary shares got 10 per cent., and the deferred shares 10 per cent.

At a meeting of the directors of the Dominion Iron & Steel Company, held this afternoon, two of the three vacancies on the board, caused by the resignations of Messrs. Pearson, Wood and W. B. Ross, were filled by the appointment of Messrs. George Caverhill and W. G. Ross, of Montreal. The appointment of a successor to Mr. W. B. Ross was deferred to a later date.

The Pittsburg Testing Laboratory Company have filed a petition at Osgood Hall for the winding up of the Stanley Smelter Works of Bannockburn, Hastings County. The claim is a protested cheque for $350. The treasurer of the company admits that it is indebted to the extent of $40,000, and is in trouble financially. About $70,000 of capital has been subscribed.

West Kootenay Power & Light Company, Limited (B.C.).—A meeting of the holders of the first mortage sinking fund gold coupon bonds will be held in Montreal on July 22nd to consider, and, if deemed advisable, pass a resolution authorizing the execution of a deed to the Royal Trust Company as trustees, providing for the payment of the bonds with interest thereon in sterling or Canadian currency.

Snowshoe Gold & Copper Mines (B.C.).—A meeting of this company was held in London last month. The directors submitted a report for the year ending September 30th, 1906, to the following effect:—During the greater part of the year the Snowshoe mine was closed down pending the completion of satisfactory arrangements for dealing with the property. On June 23rd an agreement was signed leasing the mine to the Consolidated Mining & Smelting Company of Canada, Limited. Under this agreement rather more than 6,000 tons of ore had been sent to the smelters, averaging approximately .08 ounces gold, .3 ounces silver, and 1.4 per cent. copper. The total royalties received thereon amounted to £1,997. Since the close of the financial year the original lease had been cancelled by mutual consent, and a new lease substituted, the terms of which were considered to be more advantageous to the company.

At a meeting of the Foster-Cobalt Mining Company's shareholders on June 27th it was decided to issue treasury stock. The amount of the issue is left to the discretion of the directorate. The stock is to be offered for fifteen days after July 10th at a

discount of 25 per cent. on par value. If it is not then taken up it may be offered to the public. Messrs. Jackson R. Booth and W. Hamilton Fisher were added to the Board of Directors. The total salaries of the board will now aggregate $7,000 per annum. The chairman, Mr. E. F. B. Johnston, K.C., declared that the payment of $45,000 in dividend had been a mistake. It should undoubtedly have been left in the treasury. The report of Mr. Frank Loring was read. Mr. Loring reported $60,000 worth of ore in sight. Mr. Adler, mine manager, said that $96,000 worth additional had been extracted. He recommended prospecting under Glen Lake. The present net indebtedness amounts to $11,000, plus the June accounts. All the resolutions passed with little opposition.

The annual meeting of the Dominion Iron & Steel Company, which was to have been held in Montreal on July 5th, was postponed indefinitely. The directors' annual report is given herewith:—

Before discussing the year's business your directors find it necessary to speak of the company's relations with the Dominion Coal Company, which have been seriously disturbed during the year. A memorandum covering this matter will be submitted. It may be briefly stated that in November last the Coal Company tendered large quantities of coal not in accordance with the terms of the contract, which it was impossible to use on the plant, that on the rejection of a portion of this coal the Coal Company declined to supply coal under the contract, that the company's operations have since been carried on with coal bought from various sources, including the Dominion Coal Company, Limited, but at very high prices, and that a suit is pending in the courts of Nova Scotia for the enforcement of our rights.

For greater convenience and regularity tthe coal used is charged against the operations at the contract price, $1.28 per ton, as heretofore, the excess cost has been charged to a special account with the Coal Company as part of the damages for which the suit is brought. Up to 31st May this amounted to $810,713.72, of which about $500,000 was paid to the Dominion Coal Company. The balance represents the extra cost of coal bought from others.

On this basis our earnings for the year were $2,247,536.45. The interest charges for the year were $684,384.82, and the net earnings $1,563,151.61.

From this amount we have transferred to contingent account $810,713.72 to offset the amount charged to the Coal Company for the excess cost of coal, leaving $752,437.89 of the earnings now available. Out of this we have written off the sinking fund of the first mortgage bonds, and the surplus has sufficed to cover the deficit carried from past years in profit and loss account and to leave a credit balance of $318,711.41.

The aggregate earnings from November to the end of February fell off about $250,000, as compared with the average of the preceding months of 1906.

This was due wholly to the disturbance and partial stoppage of our operations by the interruption in our coal supply. Bearing this in mind, your directors think that the year's results show satisfactory progress.

It had been hoped that a greatly improved financial position would have been shown this year as the result of surplus earings available for the liquidation of liabilities. But even under the exceptional circumstances met with, the company's affairs have improved. The greatly increased volume of business, which increases the amount of stock to be carried, and the policy of providing reserve stocks of pig iron and billets to ensure the steady operation of the open hearth furnaces and mills, account for an increase of $447,863.92 in liquid assets. Our current liabilities are a little higher, but the net indebtedness of the company is $192,221.19 less than last year.

During the year $306,335.57 was spent on capital account. The chief items under this head were the Bessemer plant, the extension and equipment of the coke ovens, new rolling stock, extension of the ore yard and its adjuncts, and extension of the plant at Wabana.

Your directors, being of opinion that the company must ultimately own or control its own coal mines, have secured options on several coal properties which are now being prospected.

Profit and loss statement May 31, 1907:—

Gross profits for 12 months	$2,247,536.45
Charges inst. of first mortgage bonds	385,387.51
Interest on 2nd mortgage bonds	120,293.44
Interest on current loans	178,703.89
Total	684,384.84
Balance net profits	$1,563,151.61

STATISTICS AND RETURNS

Shipments from the Springhill collieries of the Cumberland Railway & Coal Company, Springhill, N.S., for the month of June, were 34,310 tons.

The amount of bounties paid out on iron and steel for the nine months ending March 31st, 1907, was $1,299,801; petroleum, $266,533, and lead, $1,994.

The Dominion Iron & Steel Company's production for the month of June was:—Pig iron 23,000 tons; ingots, 24,325 tons; blooms, 208,000 tons; rails, 7,400 tons; iron rods, 6,700 tons.

The output of the Crow's Nest collieries for the week ending July 5 was 17,748 tons, or a daily average for five days of 3,549 tons. In the same week last year the mines had two holidays, Dominion Day and July 4, and the output fell to 11,692 tons, or a daily average of 2,923 tons.

The Consolidated Mining & Smelting Company's plant at Trail, B.C., received the following amounts of lead ore up to the end of May, in pounds. The weight of lead extracted is also given in pounds:—

	Ore.	Lead.
January	2,873,428	860,323
February	2,685,815	823,026
March	4,244,551	1,620,823
April	4,359,928	2,178,858
May	2,258,114	808,649

Cobalt re statement for week ending June 30th to July 6th, 1907:—

July 1st, Buffalo Mines, 120,000; July 1st, Nipissing Mines, 102,170; July 3rd, McKinley-Darragh-Savage Mine, 48,000; July 3rd, Coniagas Mine, 86,000; July 5th, Coniagas Mine, 186,000; July 3rd, Imperial Cobalt, 37,530; July 6th, LaRose Mine, 60,115; total, 639,815.

British Columbia ore shipments, week ending June 22nd:—

Boundary shipments—week, 32,080; year, 466,331.

Rossland shipments—Week, 6,285; year, 126,204.

Kootenay-Slocan shipments—Week, 2,856; year, 58,861.

The total shipments from the mines in the above districts for the past week were 41,211 tons and for the year to date 651,396 tons

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British Columbia ore shipments, week ending June 29th:—

The Boundary district made a new shipping record last week, the output being 36,781 tons, or 7,000 tons larger than the previous week's output.

The returns from the other districts show a distinct gain, and the whole total is well above the average for the year.

Appended will be found the ore shipments in detail for the past week and year to date in tons:—

Boundary shipments—Week, 36,781; year, 503,112.

Rossland shipments—Week, 6,791; year, 132,995.

Kootenay-Slocan shipment—Week, 2,898; year, 61,759.

The total shipments from the mines in the above districts for the past week were 46,470 tons and for the year to date 697,866 tons.

Glace Bay, July 3rd, 1907.—The approximate outputs for June, 1907, from the mines of the Dominion Coal Company was as follows:—

	June, 1907 (approx.)	June, 1906. (actual.)
No. 1	47,270	43,534
No. 2	55,960	51,887
No. 3	33,560	37,525
No. 4	46,500	52,779
No. 5	57,500	59,370
No. 6	20,200	3,460
No. 7	.....	11,381
No. 8	21,720	24,934
No. 9	32,940	33,866
No. 10	8,640	3,158
	324,290	325,991

The shipments for June, 1907, were 375,938 tons, and for June, 1906, 343,169 tons.

COBALT ORE SHIPMENTS.

Following are the shipments for the week ending June 29th from Cobalt camp, and those from January 1 to date:—

	Week ending June 29. Ore in lbs.	Since Jan. 1. Ore in lbs.
Buffalo	60,000	993,830
Coniagas	434,000	2,901,860
Cobalt Central	.....	101,360
Colonial	40,000	74,250
Drummond	.....	44,090
Foster	.....	140,350
Green-Meehan	.....	196,780
Kerr Lake (Jacobs)	.....	249,000
LaRose	.....	689,782
McKinley	.....	60,000
Nipissing	63,120	2,516,183
Nova Scotia	.....	30,000
O'Brien	.....	2,159,254
Red Rock	.....	49,530
Right of Way	56,500	134,530
Silver Queen	.....	389,157
Trethewey	102,000	1,295,718
Townsite	.....	84,078
Temiskaming	.....	110,000
University	.....	61,383

The total shipments for the week were 755,620 pounds, or 377 tons.

The total shipments since January, 1907, are now 12,215,143 pounds, or 6,107 tons. In 1904 the camp producer 158 tons, valued at $136,217; in 1905, 2,144 tons, valued at $1,473,196; in 1906, 5,129 tons, valued at $3,900,000.

ENGLISH COPPER MOVEMENTS, MAY, 1907.

A good deal of attention has been attracted in the copper trade to the reduced demand from abroad. The full statistics for May show exports of not quite £23,000,000, which are some £20,000,000 under the record of a year ago. The exports for the eleven months of the fiscal year of £373,000,000 are £51,000,000 under last year's record. At the same time, copper imports are increasing greatly, due to enlarged production in adjoining countries. During May imports exceeded £10,000,000, or a gain of about £4,000,000, while for the eleven months' period they made the record-breaking total of £180,000,000, or nearly £30,000 more than during the preceding year.

London fortnightly copper statistics show an increase of 1,117 tons in the quantity in sight, and 817 tons in that on hand.

New Dividends

Montreal Steel Works, Limited.—Quarterly dividend of 1 3-4 per cent., payable July 8th, and in addition an interim dividend of 2 1-2 per cent.

Dominion Coal Company, Limited (N.S.).—The half yearly dividend of three and one-half per cent. has been declared on the preferred shares, payable August 1st next.

METAL, ORE AND MINERAL MARKET

Aluminium, No. 1 grade ingots—46 cents per lb.
Antimony—10 to 14 cents per lb.
Arsenic, white—7 1-4 to 7 1-2 cents per lb.
Barytes, crude—$11.25 to $14.50 per short ton.
Bismuth—$1.50 to $1.75 per lb.
Cadmium—$1.40 to $1.46 per lb.
Carbons, for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.
Corundum—7 to 9 1-2 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$25 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 to 50 cents per lb.
Platinum, ordinary metal—$26 per ounce.
Platinum, scrap—$20 to $21 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump, 10 1-4 to 11 1-2 cents per unit.
Quicksilver—$41 to $42 per 75 lb. flask.
Talc—$18 to $23.50 per ton.
Tungsten, pure metal—$1.25 per lb.
Tungsten ore, 60 per cent. pure—$400 per ton.
Tin—42 1-2 to 42 3-4 cents per lb.

MARKET NOTES.

Spelter.—Prices have lowered. New York, 6.27 to 6.32 cents per lb.; London, £24 per long ton.

Lead.—The lead market has fallen. New York, 5.25 cents per lb.; London, £20 15s. for Spanish lead.

Northern Pig Iron.—Last half delivery; No. 1, foundry, $24.50; Bessemer, $24.

Tin.—The tin market is firm at 42 1-2 to 42 7-8 cents per lb.; London, £199 for spot.

Copper.—A late despatch from New York announces a break in copper prices. Electrolytic, 22 cents per lb.; lake brands, 22 1-4 to 23 cents per lb.; London, £99 17s. for spot.

Silver.—June 20th, 67 1-4 cents per ounce; June 21st, 67 1-8 cents per ounce; June 22nd, 67 3-8 cents per ounce; June 24th, 67 3-8 cents per ounce; June 25th, 67 3-8 cents per ounce; June 26th, 67 1-4 cents per ounce; June 27th, 67 1-8 cents per ounce; June 28th, 67 1-8 cents per ounce; June 29tth, 67 1-4 cents per ounce; July 1st, 67 3-8 cents per ounce; July 2nd, 67 3-8 cents per ounce; July 3rd, 67 3-8 cents per ounce.

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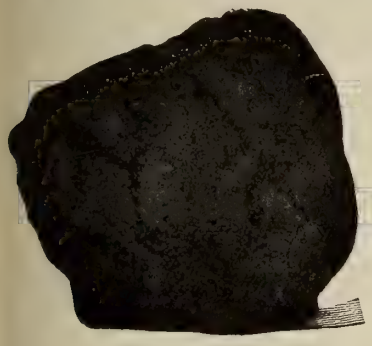
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The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such license the first right to purchase the mines. In the case of lands where the surface only is sold, the owner of the surface may be expropriated if he refuses an amicable settlement

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

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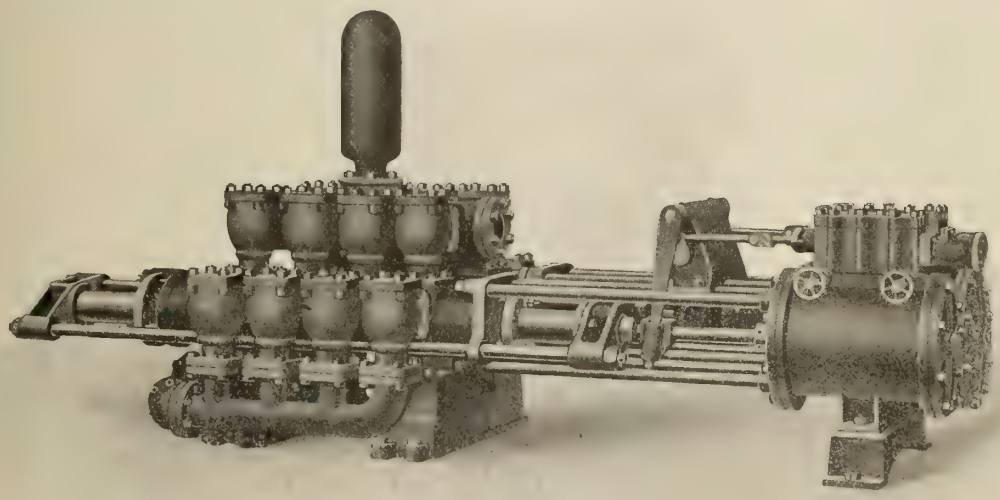
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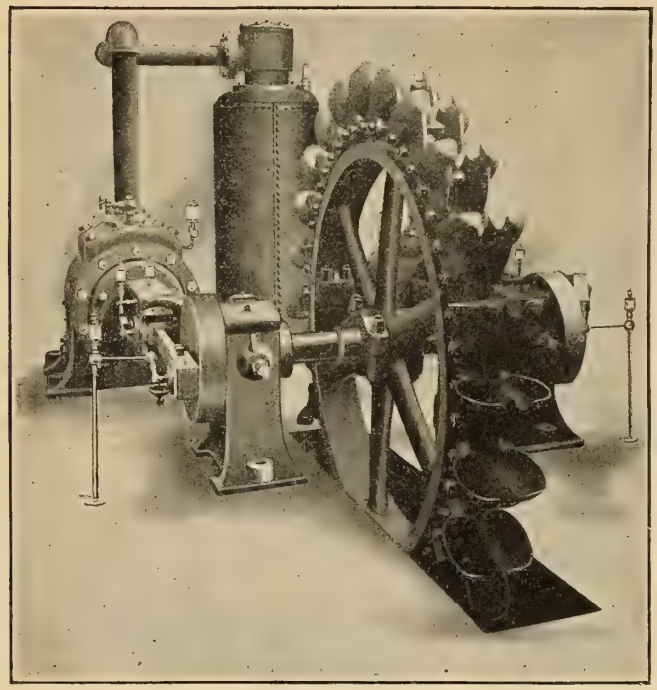
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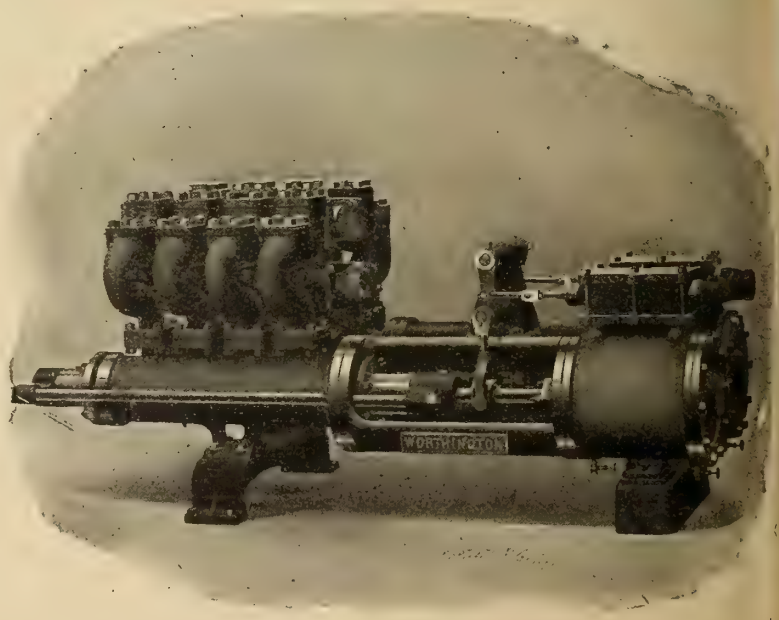
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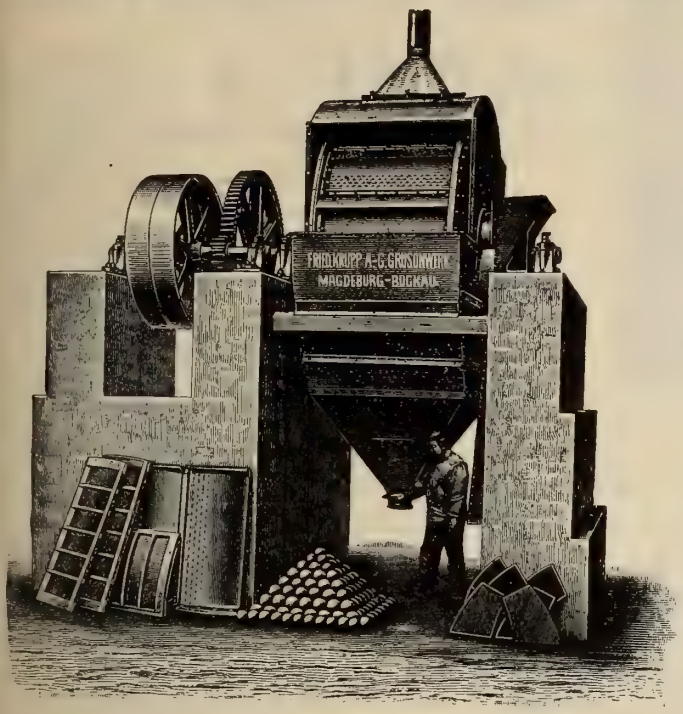
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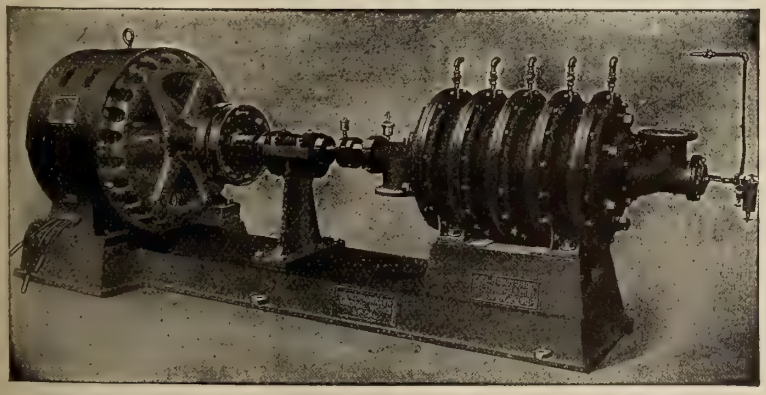
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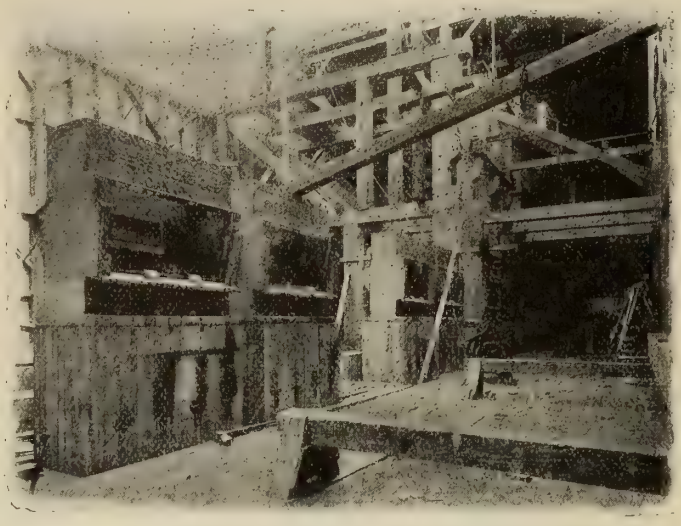
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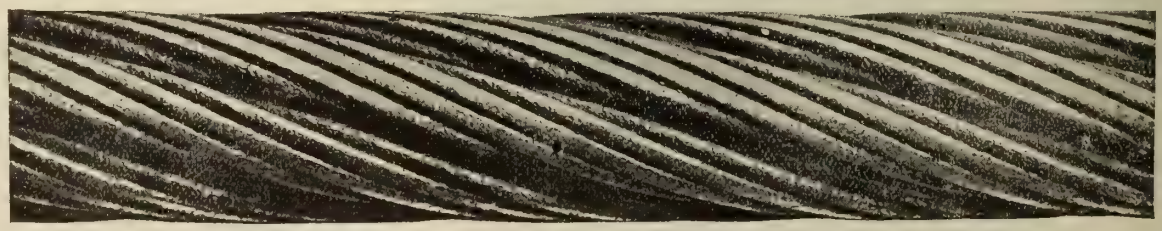


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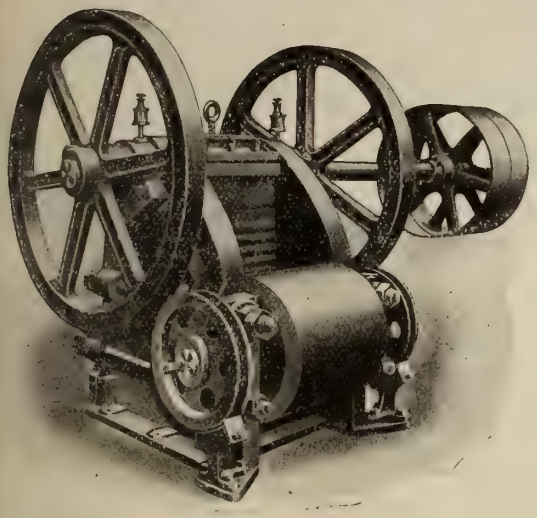
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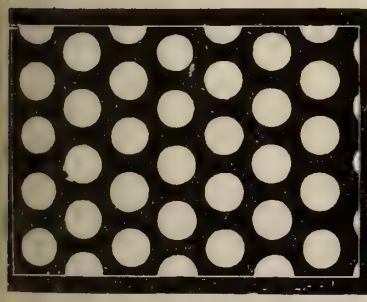
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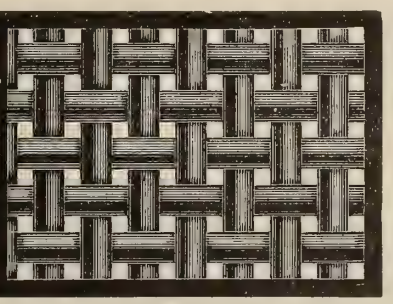
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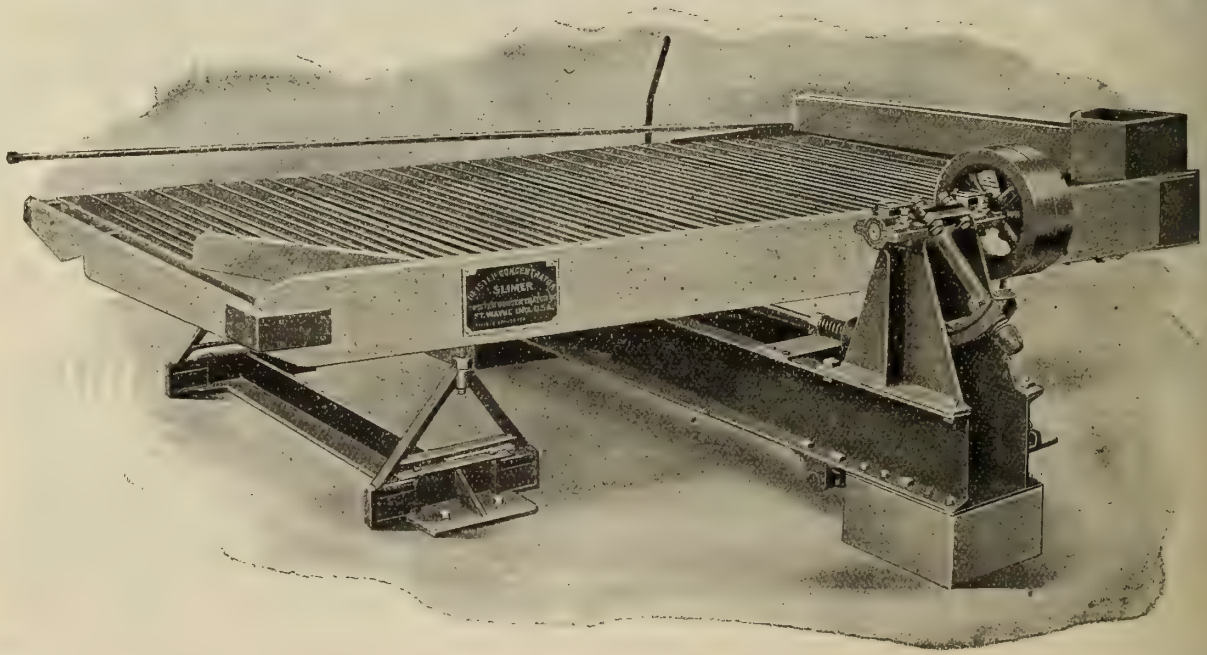
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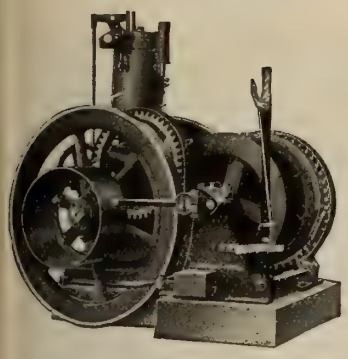
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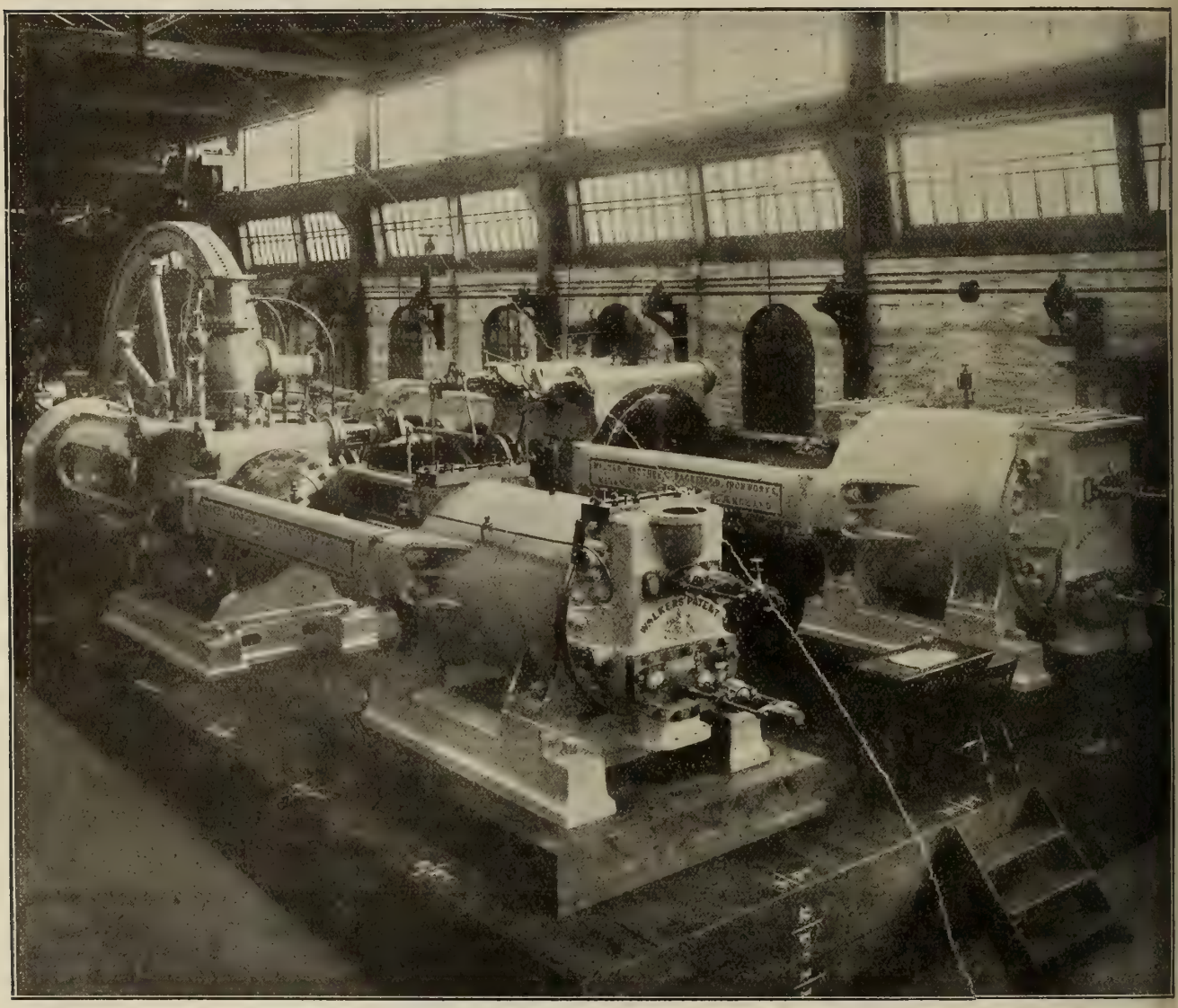
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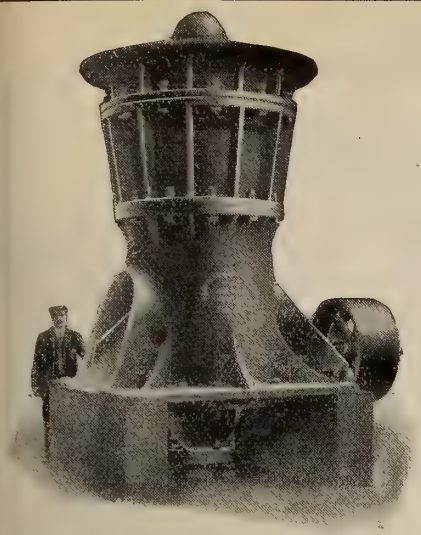
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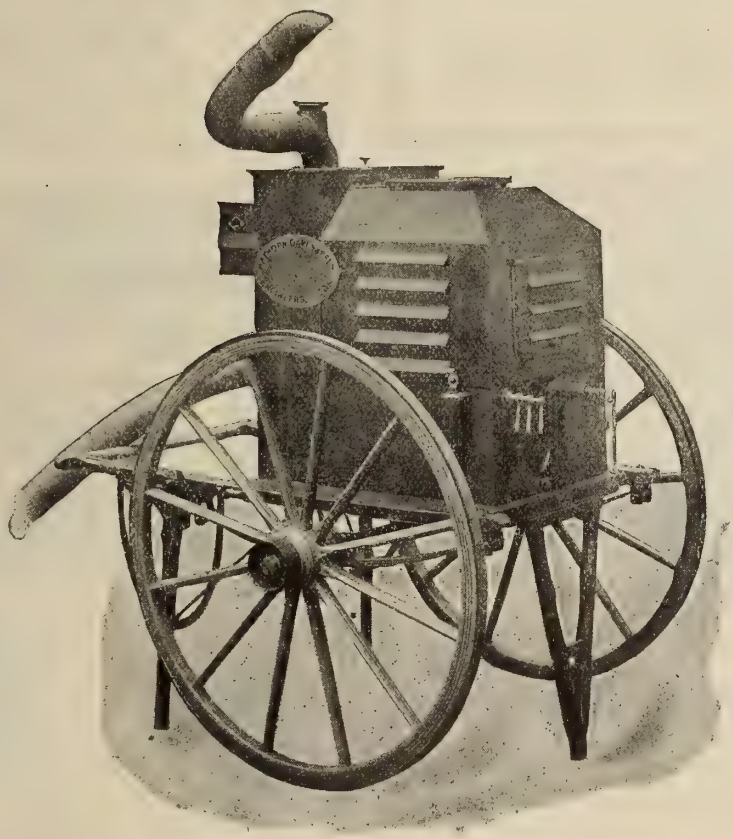
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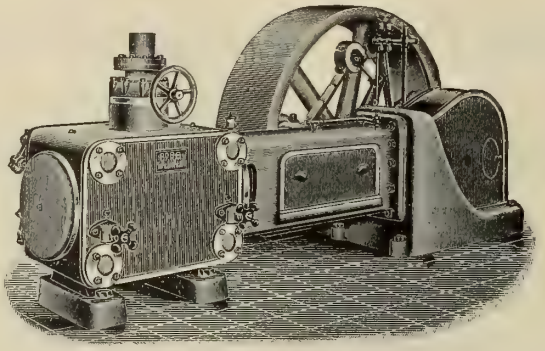
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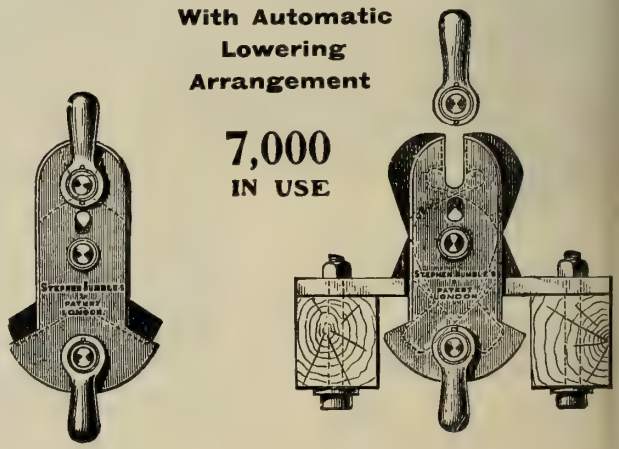
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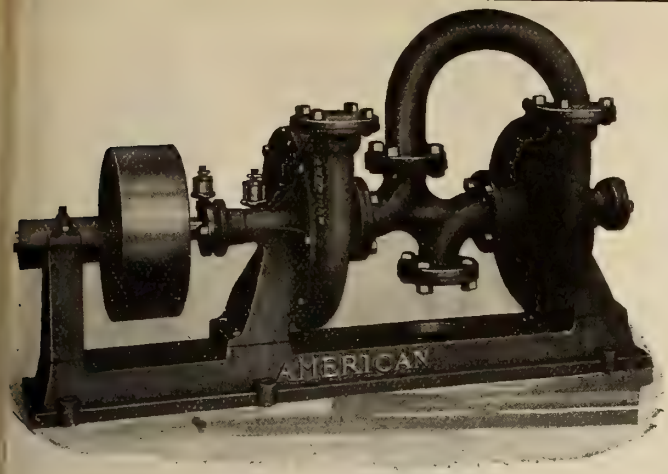
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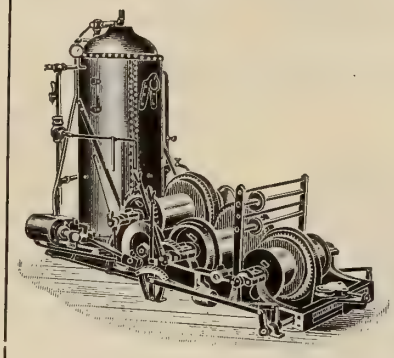
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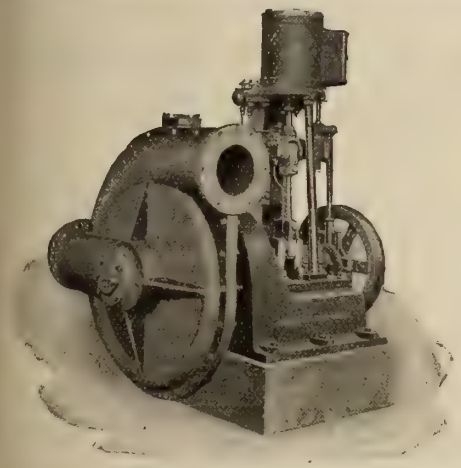
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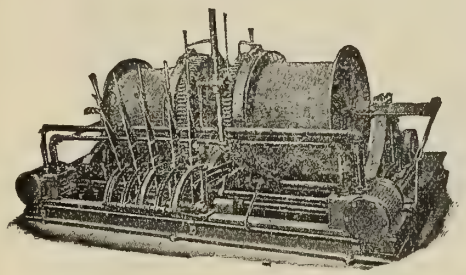
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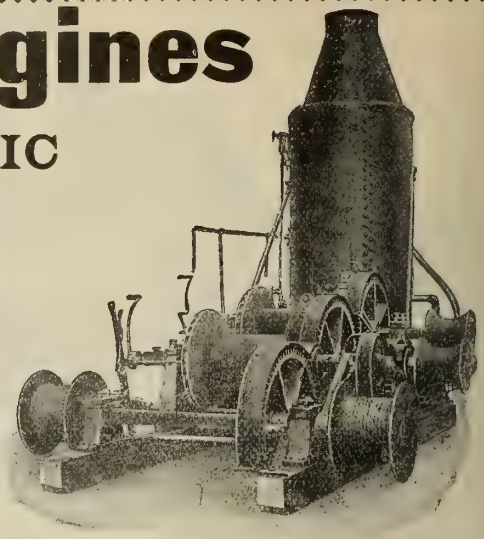
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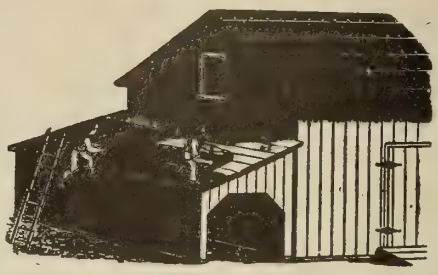
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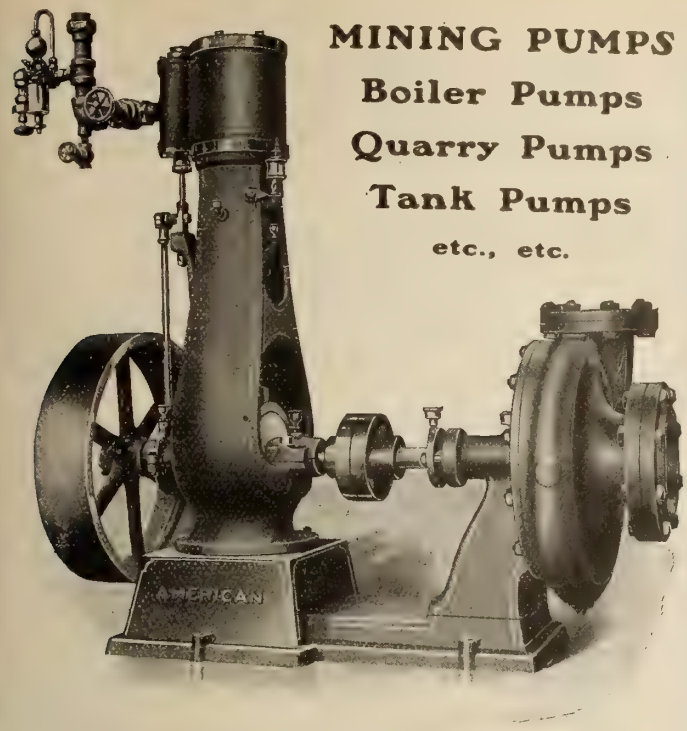
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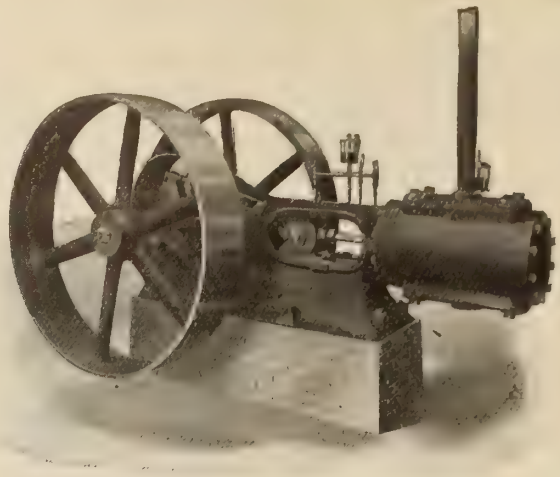
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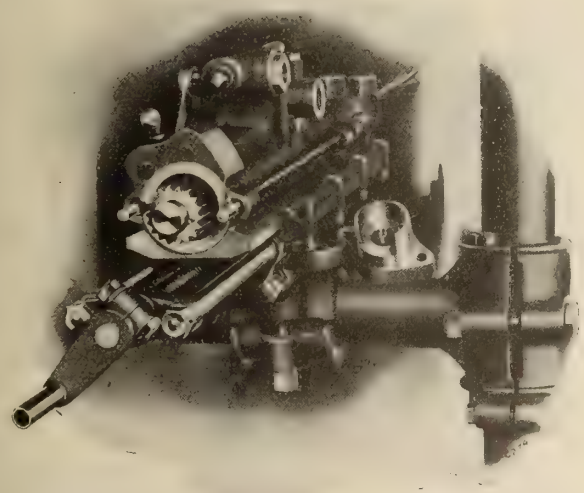


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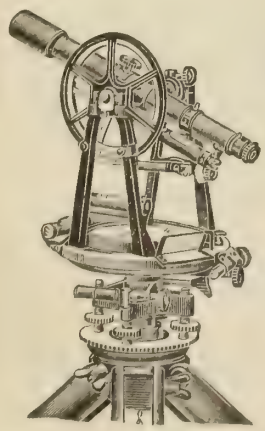
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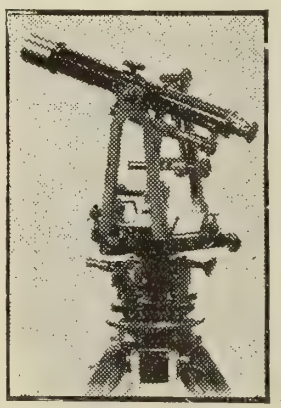
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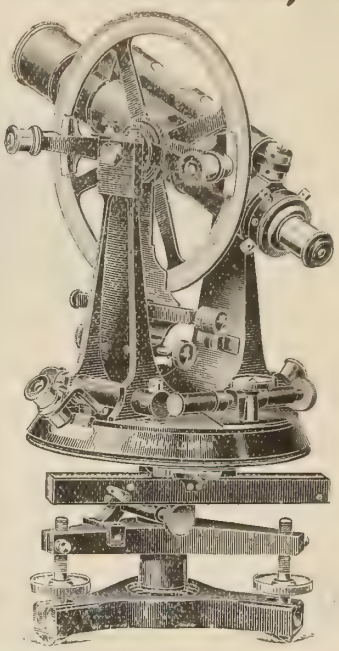
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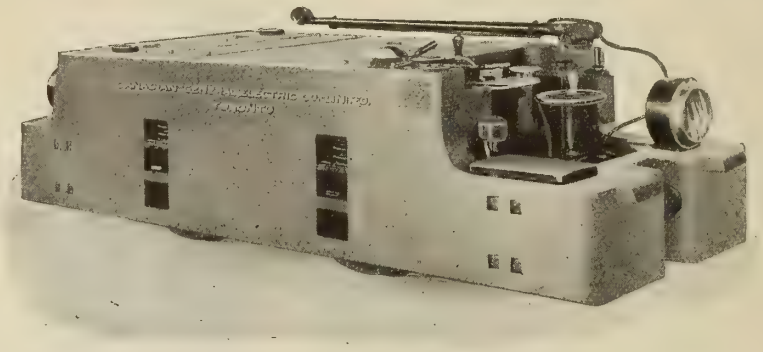
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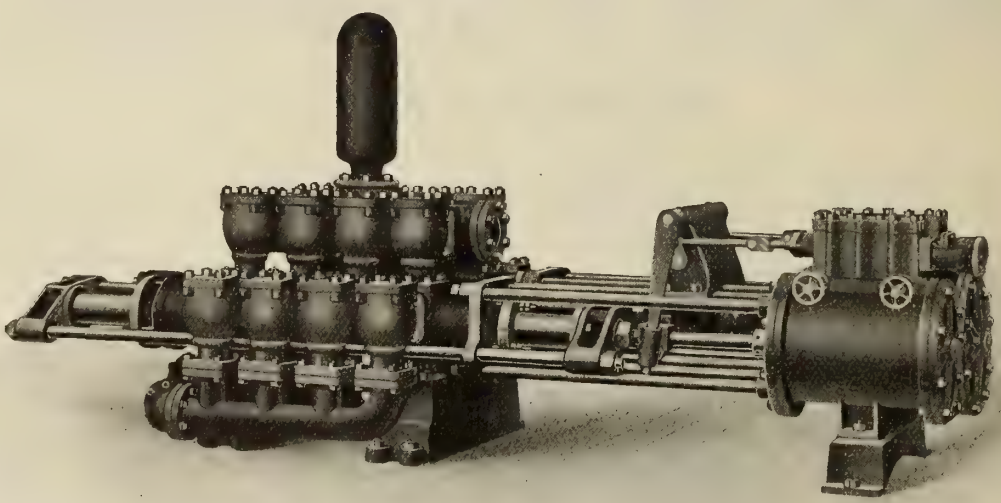
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SPECIAL CONTRIBUTORS

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CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

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ANOTHER SUGGESTION

In our last issue reference was made to the unprofitable period of quiescence, intervening between the annual meetings of the Canadian Mining Institute. We wish now to touch upon another matter, which, we submit, is of paramount importance.

Under the system now obtaining, the offices of Treasurer and Secretary are distinct. The Treasurer is remunerated at the discretion of the Council. He regulates and records all receipts and disbursements. All cheques for money to be paid are signed and issued by him, and all cheques and other negotiable paper made payable to the Institute are endorsed by him. At the end of the financial year he presents a duly audited statement.

The Secretary resides in Montreal. Upon him devolve the duties of keeping a true and correct record of all the proceedings of the Institute, and a correct list of the members and student members. He conducts the correspondence of the Institute, issues notices of meetings and has the seal of the Institute in his keeping. He, also, is remunerated at the discretion of the Council.

The duties of the Treasurer are light. His remuneration, we understand, amounts to $500 per annum, and only a small fraction of his time is devoted to the service of the Institute. The Secretary, on the other hand, is kept at least fairly busy and receives a regular salary.

With these preliminary explanations we wish to lay before the members of the Institute a few carefully considered proposals.

It is undoubtedly true that the matter of remuneration should not be left to the discretion of the Council. In practice, this tends to render the Secretary's position insecure and in certain matters weakens his hand. The division of the offices of Secretary and Treasurer is unnecessary at present. Were the two functions combined and the salary of the Secretary-Treasurer fixed at a sum equal to the total now received by both officers, the new position would be one of much greater dignity and strength. Indeed, we would go farther. We venture the prediction that, were the Secretary's position thus strengthened and were he assigned a respectable sum of money for travelling expenses, the membership of the Canadian Mining Institute could be doubled within twelve months. And it must be remembered that with a membership of one thousand the matter of the Secretary-Treasurer's salary and travelling expenses would be relatively smaller than at present.

Without doubt, the Institute needs revivifying. Equally without doubt the office of Secretary is not clothed with sufficient authority or discretion. The

logical means of infusing life and energy into the body corporate lies in making it worth while for one man to use all his time and energy in active organization and in keeping the affairs of the Institute constantly moving.

The mining industry of Canada has grown so rapidly of late years, that now, more than ever before, there is need of watchfulness. The promotion of special and class legislation, inimical to the best mining interests, should be promptly and strongly opposed. Branches of the Institute should be aided and encouraged, financially and otherwise. The present provision for the financial aid of branches is vague and the attitude of the Institute is not as favorable as might be desired.

To illustrate the need of unremitting alertness, it is only necessary to cite the following instance: When the Canadian Mining Institute was opposing the passage of the Mines Taxation Act in the Ontario Legislature, last winter, the Government emphasized forcibly the fact that nothing had been heard from the Institute until the bill had been for many months before the House. It was implied that if the mining men had been up to their business, they would have been heard from long before.

As it was, the Ontario Government heard only an ill-digested, conflicting mass of individual opinions.

Perhaps we have said quite enough to demonstrate the need of injecting life into the Canadian Mining Institute. We particularly request expressions of opinions from members of the Institute. The questions outlined above are urgent. They can be discussed entirely without personal animus. But they must be settled before the Canadian Mining Institute rises to its proper standard of practical helpfullness and dignity.

THE PERSEVERANCE OF A PREJUDICE

The belief that mining is essentially a department of the profession of gambling appears to be ineradicably fixed in the minds of the great majority of men. The element of "bull" luck upon which the ordinary prospector is supposed to depend has been largely responsible for this mischievous idea.

As a matter of cold, hard fact, no wage earner works so hard, tolerates such privations and is so scantily remunerated as the prospector. Most assuredly both the prospector, and the mining company that follows him, take chances. But who does not? Is the enterprising dry goods merchant, who starts a business in a new town, sure of his profits? If he is a sane man he will, of course, prospect his field, and estimate as nearly as may be its possibilities. But in all this he consciously accepts the risk of failure. And a not inconsiderable proportion of all new business ventures are doomed to failure.

The prospector, if he knows his business, prospects only the *probable* districts. Like the dry goods man, he must accept the risk of failure. But failure means to the prospector merely the necessity of continuing prospecting.

Thus, before the investor enters the field, the possibilities of loss are limited to the mere expenses of prospecting. With the investor, larger issues are introduced; and it is at this point that ample precautions can be taken to reduce the element of chance to a minimum. In fact a mining investment can be, should be, and often is, as safe as the most conservative industrial venture.

The necessary precautions are embodied in this sentence of advice: "Before investing in a mining property secure the services of a reputable, experienced and competent mining engineer." The business of the mining engineer is to examine mines and mining prospects. He must estimate the probable value of a mineral deposit, considering carefully the conditions of fuel supply, transportation, labor, and a dozen other factors, all of which have a direct bearing upon the cost of development. In many cases this can be done with approximate exactness. In other cases it is only possible to make an intelligent guess at either the value of the deposit or the probable cost of extraction. But in all cases it is possible for the investor to know what he is buying, whether a certainty, a probability or a "gamble." If he buys the last variety he has only himself to blame if he is disappointed ultimately.

GREAT BRITAIN'S FUEL EXPORTS

There has been a noticeable increase in the amount of coal shipped by Great Britain to France, Germany and Italy during the first five months of the current year, as compared with the corresponding months of 1906. The total value of fuel exported during 1907, up to and including the month of May, was $74,165,627, an increase of $13,000,000 over the corresponding period of 1906. Of this total France took 4,507,011 tons, Germany 3,382,734 tons, and Italy 3,371,836 tons. Thus France consumes, by a considerable margin, the largest amount of British coal. Italy and Germany take quantities less than does France, but large enough to be important factors in the grand total.

The next largest consumers are Sweden, Holland, Egypt, Denmark, Spain and the Canaries, and the Argentine Republic. All of these nations have received shipments, during the first five months of 1907, which in each case aggregate about 1,000,000 tons..

The largest increases in shipments are in those to France and Germany, both nations having taken about 500,000 tons more during the period specified in 1907 than in 1906. The United States received only 23,000 tons during 1907, as compared with 40,847 during 1906

LARDER LAKE

It is probable that the wilful misrepresentation of speculators has damaged the Larder Lake district to such an extent that its future will be seriously affected. The columns of Toronto newspapers and of publications all over the country have been freely used for the purpose of selling that which is not. No account was taken, in these iridescent misstatements, of the extreme costliness of transportation and of installation. If we are correctly informed, there is not yet a stamp mill in operation in the camp. Large quantities of machinery are assembled at points near the railroad. But between the delivery of machinery and its actual installation and successful operation a great gulf is fixed.

In any case, the first operating stamp mills in Larder Lake will be of the light prospecting type. The capacity of these mills is small. Very rich ore will be necessary to give any reasonable return on the money invested. But we have reason to believe that Larder Lake's future will depend, not upon "spotty" and uncertain rich ores, but upon the large bodies of low grade gold ore. The small margin of profit on these latter ores will necessitate large and expensive plants. It is not, then, in our opinion at least, highly probable that Larder Lake will become a steadily producing camp until the present conditions of transportation are vastly improved. But another requisite is the elimination of the "boomster" and the "fakir."

COBALT'S STRIKE

The strike situation, of which full details have been given in the daily press, is still acute. It has been resolved, apparently, into a trial of strength between the managers and the men. As is always the case, both sides have been guilty of tactical errors. So far, however, as the strike itself is concerned, there was not the slightest excuse for its declaration. The miners' complaint boils down to this, not that they were treated badly; but that it was possible that they might be treated better. The representatives of the men, in the face of recent events in the West, disregarded the machinery provided by the Federal Government and declared the strike when and how they saw fit. In this they should be condemned by all law-abiding citizens.

BRITISH COLUMBIA'S MINES IN 1906

The annual report of British Columbia's Provincial Mineralogist, Mr. W. Fleet Robertson, has been issued. It officially confirms the gratifying announcement that the mineral production of that Province for the year 1906 exceeded that of the preceding year by 11.2 per cent. The total value of the production was $24,980,546. On another page fuller statistics are given.

It will be a matter of surprise to many readers that up to and including the past year the value of coal mined in British Columbia is greater than that of any other mineral. Placer gold comes next and lode gold third.

The report is a credit to the Mines Department of the Province. In Mr. Robertson the people of British Columbia have a capable and energetic servant.

CORUNDUM AT CRAIGMONT

By H. E. T. Haultain

The Canada Corundum Company, Limited, at the present time is treating ore only from its Craig mine, situated on Craig Mountain at Craigmont, in the Township of Raglan, in the County of Renfrew, Ontario. Craig Mountain rises to a height of about 400 feet above the valley of the Madawaska River, and on its southern slope conforms to the dip of the foliation of the gneissic rock of which it is formed. Corundum occurs as a constituent of this rock, not uniformly throughout its mass, but scattered through layers interbedded with barren rock. These layers vary in thickness from a few inches to more than 20 feet. The mining operations have been confined entirely to the surface, the deepest workings being open cuts with faces of less than 40 feet. The corundum occurs in crystals irregularly distributed, and of all sizes up to 60 pounds in weight. In general it is of a brown color, varying from almost white to black. Various shades of yellow and pale green are common, red and blue occur rarely. The larger crystals frequently have considerable mica along the parting or separation planes. The chief constituent of the containing rock is sometimes feldspar and sometimes nepheline. This rock has been called syenite, and if we leave its origin in obscurity this will be a good name for it, though it would perhaps be well to modify it to gneissic syenite or syenitic gneiss. Associated with the corundum are found hornblende, mica, garnet, magnetite, iron pyrites, zircon, and other minerals. Small dykes (pegmatitic?) cut irregularly through the gneissic formation, composed chiefly of feldspar, but carrying also quartz and hornblende. There are several small veins, some in contact with the dykes carrying quartz, scapolite, calcite, iron pyrites, molybdenum, apatite and specularite. Outside of these dykes and veins no quartz has been seen in any of the workings.

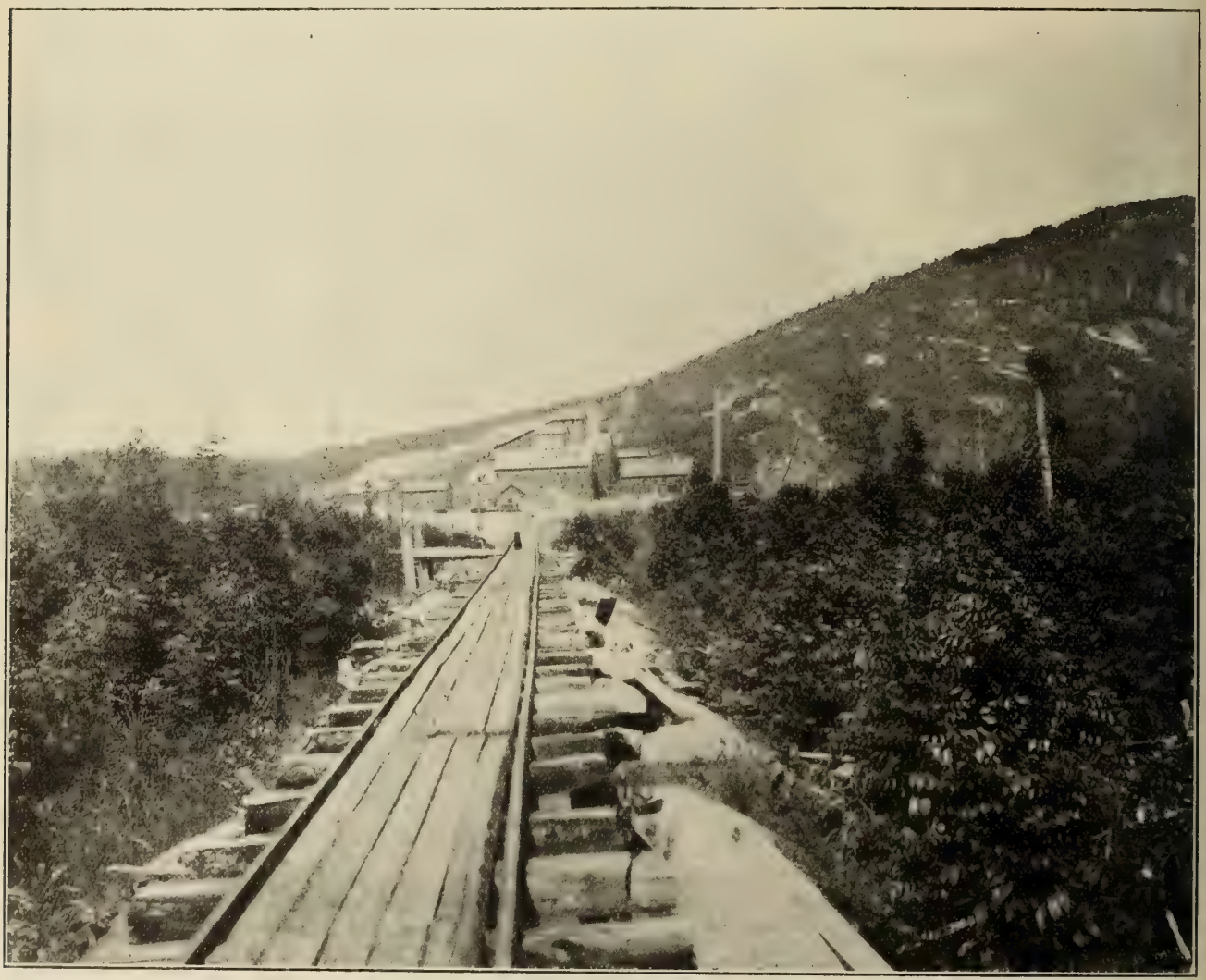
On the higher and more exposed parts of the hill the rough crystals of corundum stand out firmly from the enclosing feldspar, showing their better weathering

qualities, while lower down the hill the surface, protected by sand and gravel, shows both feldspar and corundum ground away by glacial action to an almost equal polish.

Craig Mountain is practically a mile in length, but the mining operations have been confined almost entirely to a portion of the eastern third, which is in the immediate neighborhood of the mill, but throughout the full length of the hill surface outcroppings show corundum with the same general characteristics of formation persistent from east to west.

Of the origin of the corundum in these rocks very little is known. It is work for the ultra specialist in geology and petrography, and calls for laboratory as well as field work. Those who have studied it most deeply have not yet published their conclusions. The only opinions that the writer has ventured to have on the subject are to the effect that the corundum-bearing rocks are not dykes, that they are not eruptive, and that there is no sign of segregation from magma. How, when, or why the corundum was formed is beyond the writer's line of work.

The first discovery of corundum in Ontario was made nearly thirty years ago on this Craig Mountain, then known as Robillard's Hill by Henry Robillard's daughter. As a small child she picked up and carried home a crystal that "looked like a cruet stopper" For years it remained an unnamed curiosity, but at the time of the phosphate excitement it was declared to be phosphate, and Robillard and Fitzgerald located the ground as a phosphate mine. In 1896 Ferrier, of the Geological Survey, described the presence of corundum in the neighboring township. Mining operations were commenced May, 1900, the ore being transported in wagons half a mile to a small mill built on the site of a small water power. In March, 1904, the present large mill commenced crushing. This mill is by far the largest corundum mill ever built, and is the largest concentrating plant in Canada. It has three divisions, the main mill, the grader, and the finishing department, the latter a comparatively recent development. In the main mill the rock is crushed till 90 per cent. of it will pass a 2.5 millimeter round hole, by means of four rock-breakers and five sets of rolls. It is concentrated on 20 Overstrom tables; the concentrates, which contain from 50 to 60 per cent. corundum, passing into bins for drainage. In the grader these concentrates are dried, pass over magnetic separators, sized into 20 sizes from 8 mesh to 200 mesh, and still further subjected to concentration on Wilfley tables and Hooper pneumatic jigs. The resulting product is again dried and again sized and passed into bins, from which it is drawn off into 100 pound bags. Each day's run of bags is sampled by hand, each size by itself, and these samples are carefully assayed, and according to



MILL AND SOUTHERN SLOPE OF CRAIG MOUNTAIN

the assay results the bags are stocked in position in the finishing department. The finishing department performs three functions. It thoroughly mixes the product so as to give a uniform material complying closely with fixed standards. It re-screens each size so as to eliminate the results of carelessness in the grader. It automatically samples every lot of thirty bags. The finishing foreman, knowing the assays of the contents of his bags, mixes thirty hundredweight at a time in a hopper. From this hopper the corundum passes in a thin flat stream past a draft of air, which blows away the mica. It then passes over a set of shaking screens, which screen out both undersize and oversize, and from this it passes to a bin whence it is drawn off past an automatic sampler direct into canvas bags, which are filled to contain 100 pounds of corundum. These bags are then sewn up by machinery and marked for size and lot number. The samples are tested by hand screens for accuracy of sizing, by the eye for pyrites and hornblende contents, by a magnet for magnetite contents, and in the assay office for both corundum and iron content. On the receipt of the assay results, the bags are marked G or G1, G grade being for silicate wheels and the polishing trade, and G1 for the vitrified wheel trade. A sample weighing about half a pound representing each lot of thirty bags is stored for reference. In the winter the bags go by sleighs 21 miles to Barry's Bay on the Ottawa Division of the Grand Trunk Railway, and in summer to the same place by barge and steam tug. From here they are shipped to all parts of Canada and the States, and to stock storehouses in Manchester, Paris, Antwerp and Hamburg for distribution in Europe.

In 1906 the mill produced 2,900 tons of finished grain corundum, and is being constantly improved and added to, to handle both larger tonnage and lower grades of ore. During April and May a little short of 7,000 tons of rock were crushed each month. Rock containing as low as three per cent. corundum is successfully treated.

Corundum is the second hardest mineral, the only other equalling or surpassing it being the diamond. On account of this hardness, and on account of its peculiar form of fracture, it makes an ideal abrasive material and is used as such both for grinding and polishing all over the world in all classes of work. As with nickel, cobalt, mica and asbestos, Ontario holds a unique position in regard to corundum. She has practically unlimited deposits The Canada Corundum Company has extensive areas in six townships, besides the one on Craig Mountain, and produces from this one deposit considerably more than all the rest of the world.

Before 1900 the hard abrasive field was held almost entirely by emery, which is a natural product, consisting of a mixture of corundum and magnetite and hematite. Carborundum, the trade name for carbide of sili-



THE MILL OF THE CANADA CORUNDOM COMPANY

con, an artificial product manufactured in the electric furnace, was at that time coming strongly into the market and has since then made great strides. It is of about the same hardness as corundum, good crystals of it being somewhat harder and able slightly to scratch the corundum crystal, but it differs very much in the form of fracture and in the shape of the grains and of the cutting edges. Recently there have been put on the market other artificial abrasives, of which perhaps the most important is alundum, an artificial corundum made in the electric furnace from bauxite. Good compact specimens of this are as hard as corundum, but the fracture and form of cutting edge is very different and the product varies in texture.



CRAIG MOUNTAIN AND MILL

These four hard abrasives, emery, corundum, carborundum and alundum, practically hold the market, but corundum does not hold the place that its qualities warrant. Emery holds its position by right of age. For so long a time was it the only hard abrasive that its name began to have a general application, being used instead of the general term abrasive rather than as applied to a specified mineral. Even to-day all classes of manufactured grinding wheels are called emery wheels; even the Corundum Company's own men refer to corundum wheels in the machine shop as emery wheels. Carborundum and alundum have had the advantage of magnificent advertising. Alundum is controlled by what is probably the largest and oldest abrasive wheel concern in the world. They make a specialty of it and practically confine the use of it to their own goods. Carborundum is also treated as a specialty, the company manufacturing it also making it up into all forms of wheels, blocks and papers, and controlling the sale of the articles manufactured from it. The controlling use of a special product and its special name is in itself a splendid trade asset.

Corundum has been handled on a different basis. It has been considered a raw material and has gone into the market as a competitor of the raw material emery, and it has been free to the use of anybody who chose to buy it. It is easy to be wise after the event and it is too late now for criticism, but the writer thinks that if the policy adopted by the owners of carborundum had been followed by the Canada Corundum Company, corundum would have travelled much further, in fact might to-day have been almost alone in its position in the abrasive field, instead of being one of several. The making of an abrasive wheel is a difficult art; it is easy to make a poor wheel out of the very best abrasives. It takes capital, effort, experience and skill to make a good wheel, but it takes much more capital, greater effort, a far wider range of experience and a much more extensive organization to produce the grain corundum. Grain corundum is not a raw material; it has required very

much expensive experimenting, and the combined experience of many men gathered in all parts of the world to produce the high grade uniform product of to-day. But the policy of selling to everybody has been adopted and will in all probability be adhered to. Of late years the Canada Corundum Company has done very little advertising. In its earlier years it advertised fairly extensively; in fact the publicity department was far ahead of the production department, and it was impossible at that time to make good on the promises held out to the public. For more than eighteen months past the cost of advertising has been less than $100, and only for a few weeks did the company have a salesman in the field. There was practically no solicitation of orders by mail. All that was bought sold itself. The sales for the past three years have been as follows:—1904, 855 tons; 1905, 1,545 tons; 1906, 2,700 tons. This is a very remarkable record, for the public is so accustomed to advertising in these days that it thinks there must be something wrong in an article not advertised. The most exclusive monopolies advertise—Standard Oil not only advertises, but makes extensive use of salesmen. The Canada Corundum Company has had a big problem; it has had its full share of difficulties, and it has required time to even realize the existence of these difficulties, and many of them are not only not yet solved but not yet tackled. Probably the greatest drawback was the magnificent enthusiasm and optimism of its early days. This enthusiasm was bad in many ways; it kept the company blind to the difficulties and pitfalls, it prevented forethought, and it was of necessity followed by an almost disastrous reaction of disappointment and depression, through which the company was safely brought only by the tenacity of its larger shareholders. This is probably the common history of all mining enterprises. In these days things have come to such a pass that the public, even our best business men, will not go into a mining venture unless they are promised almost fabulous returns. This has bred a class of promoter over-rich in enthusiasm and optimism. We may take it as part of a normal course, almost an unavoidable course for every mining company to have its period of extreme depression. In the hands of the promoter the pendulum is at one extreme; as the true facts of the case begin to appear they will be accompanied by fears and doubts, and the pendulum will swing to the other extreme. Very often it will swing off the hooks altogether, but if the enterprise has real worth, tenacious shareholders may hold things together till they are reorganized on a normal basis.

But corundum in Ontario had more than the ordinary mine's share of troubles and difficulties, in fact there never was a clearer case of not being able to see the woods on account of the trees. There were so many difficulties in the details obscuring a view that it was next to impossible to see with clearness the general problem. An account of these difficulties and the efforts that were made to overcome them hardly belongs to the sphere of the present article.

Those in control of affairs at the start had to face new and unknown conditions in every part of their work. The nature of the deposit was wholly unknown; the problems of concentration were in many respects entirely new; the district, though in the centre of Ontario, was, from a miner's point of view, as isolated as the Sahara, the tributary labor supplies being entirely ignorant of mining and milling conditions. The demands of the market were unknown and the connection between the true demands of the market and the technical possibilities of milling conditions was wholly conjectural. Many different types of manufacturing concerns needed corundum, but they were not aware of the fact, and this called for missionary work of a distinctly pioneer character. After the missionary work was well started and people began to learn that they needed corundum, they did not know how to use it effectively, and this called for more missionary work of a different type. The directors were not mining men, and though they were prominent and successful business men, they were ignorant of mining conditions; they had never leant how completely local circumstances could alter cases; they had never suffered from the tyranny of local conditions. The problem called for scientific technical work of the highest degree. It called for an organization that would get high grade technical results from a most unsatisfactory untrained class of labor. It called for commercial acumen of a broad and far-seeing type; it called for business energy of the type that would not overlook the smallest detail. It is comparatively easy now to see some of the mistakes of the early days. Five men, as managers or superintendents with experience gained all over the world, have put their efforts into the solution of the problem, and they have left legacies of successful work as well as of mistakes. The mill itself is rather a remarkable legacy; it was designed by one man, the plans were altered by a second; the mill was built by a third, who left shortly before completion of construction, so that its early operation was conducted by a fourth. A fifth was called in to prepare plans for improvements and alterations, which plans were consigned to the care of a sixth to carry out, but they were altered by a seventh. In pioneer work we learn largely by mistakes; they are essential to progress. Probably the successful mining man is the amn who feels his way by his mistakes but is quick to see his mistakes and cut them short.

At the present day most of the difficulties arise out of the unsatisfactory labor supply. Though Craigmont is somewhere midway between Toronto and Ottawa, it is so far from the main avenues of travel that it remains in complete isolation. In the neighborhood of the mine there are several men and women who have never seen a railway train. The writer was driven from Craigmont to Barry's Bay last winter by a bright active boy of twenty, with a good country school education, who saw a locomotive for the first time that day. The local labor supply is small and very irregular, depending upon the season and the harvest, and the supply is kept up by importation, not quite so systematic or so coercive as in the Transvaal, but still containing all the unsatisfactory elements of labor importation. In these days of prosperity, Cobalt excitement, and cheap harvest excursions to the Northwest, the laborer is very independent and very restless. In the twenty months that the writer has had charge of the affairs at Craigmont, there have been on the books of the mill foremen 260 names. This is in the main part of the mill, where the full crews for both shifts consist of twenty-five men. Of these 260 men only two had ever seen a concentrator outside of Craigmont. In one month twenty-eight new men were taken into the mill, and the men in every position, including both foremen, were changed. Very few of the men are dismissed, the majority of them quitting of their own accord, chiefly through restlessness. Concentration is an art depending under ordinary conditions more upon the man behind the machine than upon the machine or the method. In the concentration of corundum not only is the problem rendered more difficult by the small difference

in specified gravity between the corundum and the waste minerals, but the finished product must be cleaner and of a more uniform standard than in any other branch of concentration. The obtaining of these results under the local conditions of Craigmont has called for the development of a method extreme in the direction of fool-proofness and in an organization designed principally to take care of and teach the new unskilled workmen. The hardness of the mineral to be saved and the habit of its fracture more than counterbalance the drawback of its low specific gravity. The absence of any differential surface tension action makes the cleaning of the slimes and finer sizes a difficult and wasteful process, but with all the coarser sizes the high grade of product is maintained without serious difficulty.

The problems of the selling department have also their intricate details; as an example, until very lately the publicity department has included in all its advertising literature the statement that the abrasive efficiency of emeries varies according to the percentage of corundum that they contain, and the inference has been made that because Craig mine corundum contains twice as much corundum as does a high grade emery it must be twice as good. This may be a partial truth, but has been a very serious fallacy, as it has not only emphasized the competition with emery but has largely governed (in the wrong direction) the selling price. In reality, though, both crystal corundum and emery owe their abrasive qualities to the corundum content, the percentage of corundum present has practically nothing to do with the relative efficiency. In the case of emery, most of the corundum is present as a delicate sponge-like skeleton filled in with iron axide. When this iron oxide is dissolved out by acid this skeleton shows to be granular and easily crumbled. In work it is supported by the iron oxide, but its action is a fine scratching rather than a cutting. With crystal corundum the working edge is a firm, hard, sharp edge that cuts cleanly without a sign of rubbing or scratching. Emery and corundum should not be considered as being in the same class of abrasives. This difference in the texture or mechanical character of the individual particle also had much to do with the hindering of the progress of corundum in its early days. The success of an abrasive wheel or an abrasive paper depends as much on the bond as on the abrasive. Emery, on account of its rough, almost porous, surface, is easily held by any bond or glue; corundum, on the other hand, on account of its smooth, dense surface, is much more difficult to hold, and as it takes a much harder bite on the metal it needs much more careful holding. The result was that many of the early products were most unsatisfactory because of the rapidity with which the corundum was pulled away from its bond. The excellent work done by some of the wheel manufacturers of the States have completely overcome this difficulty in the manufactured wheel, but in the polishing trade, where the individual factory or probably the individual workmen attaches the abrasive with ordinary glue to a soft wheel, this particular trouble has often condemned the use of corundum in favor of emery.

The main efforts at Craigmont to-day are directed towards increasing the capacity of the mill, the elimination of horneblende and garnet from the products supplied to the vitrified wheel makers, and the collecting of a nucleus of steady contented workmen trained to the special character of the work. Good progress is being made in each case. Beyond the elimination of the horneblende, no effort is being made to increase the purity of the output. The standards which have been adopted, and which are adhered to very closely, are accepted as being perfectly satisfactory by the most exacting wheel makers on the continent, and the reputation for uniformity of quality and steadiness of supply has been fully established. More than 300 men are now employed on the works.

THE PROFESSIONAL IDEALS OF THE TWENTIETH CENTURY

A Plea for the Higher Conception of the Engineer's Relation to Society.

(Arthur Twining Hadley—Dedication of the United Engineering Societies' Building.

The great element of progress in the nineteenth century has been the recognition on the part of mankind in general, of the value of scientific generalizations in very department of human conduct. Our science has become sounder, our understanding of its applications clearer, and the public has recognized that scientific conduct of a business means the substitution of universal experience, learned with difficulty and applied with toil, for the narrower range of individual experience which was at the disposal of the so-called practical men of fifty or one hundred years ago. Of this change the engineer is the representative and the leader. He it is that makes physical science in its various lines applicable to the complex problems of construction and development. He it is who has paved the way for the recognition of the technologist and the expert in every line of human industry. He it is who has shown how mathematics, instead of being an abstract discipline, remote from everyday human affairs, may become the means of applying truths for a long time remote and undiscovered, to the everyday affairs of the world in which we live. Not the buildings that you have built; not the railroads that you have planned; not the machines that you have invented, represent your greatest achievement. Yours is the proud boast of having in one brief century established science as the arbiter of the material affairs of mankind, and of having enforced her worship upon a world once reluctant but now gloriously admiring.

Well, then, you will ask: is there anything which remains to be done comparable in importance to this? Yes, there is. An equally large part—perhaps in one sense a much larger part—of your professional duty yet remains to be accomplished. It is not enough to have technical training. It is not enough to know the special sciences on which the practice of a profession is based. A man ought to have clear conceptions of the public service which his profession can render, and the public duty which its members owe. Thus, and thus only, can the engineer, the lawyer, the physician, or a member of any other learned profession, rise to the full dignity of his calling.

For there are two quite distinct qualities which must be combined in order to secure the best professional services; two quite distinct tests which work must meet in order to be pronounced first-class. One of these is the technical standard; the other, for want of better word, may be called the ethical standard. The man who wishes to build a good railroad must not only lay it out according to the rules of the surveyor's art, with proper curves and grades, and bridges which will not fall, but he must also have intelligent regard to the needs of the population, the safety of travel, and the many other factors which determine whether a railroad shall be a

work of public use or a source of industrial bickering and financial disaster. This combination of public and private demands is not peculiar to engineering. It can be illustrated in every other profession of importance. It is not enough for the lawyer to give advice which shall be technically sound, and which shall enable his clients to keep out of jail. He must learn to take a large view of the law as a means of public service instead of private gain. It is not enough for the physician to know how to cure specific diseases. He must know how to care for the larger problems of public health, and to use the resources of the community in a way to meet as fully as possible its sanitary needs.

This larger view of professional obligations is not so fully recognized as it should be. We have in the nineteenth century made so much progress in the technical training of doctors and lawyers and engineers that we sometimes forget that there is need of anything more than technical training. We have let the old idea of public leaderships, which was prominent in the minds of the great professional men of past centuries, give place to another and narrower ideal which is fully satisfied when a man has made himself a technical expert. Many a man of real eminence in his calling deliberately rejects the wider conception of professional duty which I have here indicated. Perhaps he recognizes the claims of public service; perhaps he does not, but in any event he believes that these claims rest upon him as a man rather than as an engineer or a lawyer. In his professional capacity he says he is hired not to tell what the law ought to be, but what it is; not to advise how a railroad can do the most public service, but how certain men with certain ideas of their own can best use the differential calculus to get these ideas carried out. This is perhaps the prevalent view of professional ethics today. I believe that it is a wrong view, which must menace not only the influence and standing of the professions themselves, but the general interests of the republic.

Mere technical achievement is not the thing that endures. Among the peoples of the ancient world, I suppose that there were no engineers equal to those of Egypt. Considering the means at their command, the things they did were very absolutely extraordinary. They did some things which, even with the means at our command, we can hardly duplicate. But they used their abilities in the service of a dominant priestly caste; and therefore, while their work fills us with admiration, it does not appeal to us as does the work of the Roman engineers a few centuries later, who built roads and aqueducts and bridges, and thus took the lead side by side with the Roman lawyers in establishing the basis of modern civilization. The roads and bridges of Rome, simple and straightforward as they are, constitute a more enduring monument to the Roman engineers than all the obelisks and pyramids that were ever erected.

A commonwealth like that of the United States is necessarily governed by public opinion. Courts may formulate this opinion. Legislatures may pass rules to give effect to it. Police may enforce its demands against the recalcitrant. But the governing power rests in the intelligent public opinion itself. When that opinion ceases to be intelligent and powerful, freedom becomes a mere name. Now, a serviceable public opinion of this kind can only be formed when intelligent people, technically trained for different lines of life, seriously try to find out how their work can be made to meet the public needs. They are the only ones who can do this well. If it is done by anyone else it will be done badly. If the lawyers as a class try to keep the law in line with the demands of intelligent public opinion, we can get good law. But if the lawyers are content to see the law perverted to private ends, and judges take refuge in technical construction of precedents, without full regard to the needs of the existing situation, legislatures will step in to create a chaos of conflicting laws which are worse than no law at all. In like manner, if our engineers get their own minds clear, and get the public mind clear, as to the political economy of the properties entrusted to their charge and the ethics of their management, they can forestall these conflicts which now threaten to break out at every moment. But if the members of a profession whose advice is necessary for a clear understanding and wise settlement of these problems retire from the field of action, the matter will be settled by those whose interests are more selfish and less far-sighted. There are three professions to-day which do not regard themselves as servants, but as masters—the financier, the journalist and the politician. If the engineer and the lawyer accept positions as servants, simply putting their technical knowledge at the disposal of merchant, journalist or politician who will pay the highest price for it, it is not simply a confession of inferiority, it is a dereliction of public duty.

GAS POWER

In a series of articles on gas power, contributed to the magazine *Power*, Mr. F. E. Junge has dealt with gas engine practice in Europe and America, and has elaborated the conditions under which it has been retarded in America. Estimating the aggregate power developed in the United States at 14,465,000 h.p., of which 10,664,560 were developed from steam and only about 300,000 from gas, and taking the average price of coal at $2 per tone, Mr. Junge figures that of the 100,000,000 tons consumed for power purposes, at least one-half could have been saved by the adoption of gas generation. On this basis an annual saving of $100,000,000 could be effected.

"There should," writes Mr. Junge, "be more treatises to appeal to the interests of wider industrial and commercial circles, demonstrating the possibilities and clarifying the limitations of the application of gas power in the varied industries." Continuing, he attributes the scarcity of good literature on the subject to the fact that those men who are best qualified to discuss and write upon gas engineering, are prevented by the firms controlling their services from making public such data as would be of practical us to the working engineer. This spirit of commercial secrecy compares but poorly with the liberal attitude obtaining in other contries.

"But here is where this special trouble is wedded to the lamentable plague of commercialized engineering which is threatening us to-day in all progressive countries: Monopoly, the great discourager of effort in trade, manufacture and profusion, will dictate the technical methods to be followed, thereby suppressing individual aspirations; few great corporations will buy up the highest grade of skilled talent, literary, inventive, mechanical, but will keep it latent or at least barren of creative work, by raising almost insuperable barriers to the propagation of the fruits of its labor . . . It is hoped that the vastness and multiplicity of interests involved in the gas power field will effectively prevent centralization of the kind that precludes a stable and healthy industrial growth."

ANNUAL REPORT OF MINISTER OF MINES FOR BRITISH COLUMBIA

The annual report of the Minister of Mines for British Columbia for the year 1906 has been published. It is later than usual, the Bureau of Mines for that Province having previously for several years been able to distribute its annual report a month to two months earlier than this year. The delay has been occasioned by the press of work in the Privincial Government Printing Office, which for some time past has had its work greatly increased by the very considerable enlargement of the official *Gazette*

The report under notice is similar in size and general character to those issued by the Mines Department for a number of years. Its statistics of quantity and value of mineral production show the output of 1906—which was a record year as regards both quantity and total value of the mineral products—and, too, for purposes of comparison, that of all years from the time production was commenced in the Province. These tables have been carefully prepared and arranged in such form as to clearly convey information relative to the steady expansion of the mineral industry of British Columbia from the time it was of comparatively small proportions until now, when its total for the year of approximately $25,000,000 is about 31 per cent. of the mineral production, metalliferous and non-metalliferous, of the whole Dominion in 1906.

The reports of gold commissioners and mining recorders appear to have been reduced to what is of general interest concerning their respective districts. Those of other district officials in like manner have been kept within reasonable limits. The special reports of the Provincial Mineralogist and Provincial Assayer are properly of greater length. That of the Provincial Mineralogist, descriptive of his exploratory trip through the Peace River country, dealing as it does with an extensive region that it may be expected will within two or three years be thrown open for settlement, is of particular value and interest and will doubtless be widely read. The numerous illustrations of places and scenes in that outlying country enhance the value of the report and serve as useful object lessons to those desirous of learning something of the big new district in Northeastern British Columbia that will probably become settled ere many years pass.

A new feature in the report is the list of metalliferous mines shipping in 1906. Arranged according to districts, and showing location, name and address of agent or owner, and the class of ore produced by the numerous shipping mines, this list will be useful to many. It has been prepared following the frequent receipt by the Bureau of Mines of applications for information of this nature.

The half-tone reproductions of photographs merit especial commendation. The excellent work of Mr. Wm. H. Clark, foreman of the Government Printing Office pressroom, has again given very creditable results in this connection. Diagrams, maps, etc., have also been effectively used for purposes of illustration. A comprehensive index completes the report, which, as in former years, has been prepared under the direction of Mr. Wm. Fleet Robertson, Provincial Mineralogist.

Some of the statistical tables, with official comments thereon, follow:—

TABLE I.—TOTAL PRODUCTION FOR ALL YEARS TO 1906, INCLUSIVE.

Gold, placer	$ 68,721,103
Gold, lode	41,015,697
Total gold	$109,736,800
Silver	25,586,008
Lead	17,625,739
Copper	35,546,578
Coal and coke	79,334,798
Building stone, bricks, etc.	5,543,700
Other metals	270,099
Total production, all years.	$273,643,722

This table shows the total gross value of each mineral product that has been mined in the Province up to the end of 1906. From this it will be seen that coal mining has produced more than any other separate class of mining—a total of $79,334,798—followed next in importance by placer gold at $68,721,103, and third by lode gold at $41,015,697. The metal gold, derived from both placer and lode mining, amounts to $109,736,800, the greatest amount derived from any one metal or mineral, the next most important year being copper, of a total gross value of $35,546,578, followed by silver at $25,586,008, and lead at $17,625,739.

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1890 TO 1906 (INCLUSIVE).

1852 to 1890 (inclusive	$ 71,981,634
1890	2,608,803
1891	3,521,102
1892	2,978,530
1893	3,588,413
1894	4,225,717
1895	5,643,042
1896	7,507,950
1897	10,455,268
1898	10,906,861
1890	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
1905	22,461,325
1906	24,980,546
Total production, all years.	$273,643,722

This table shows the values of the total production of the mines of the Province for each year from 1890 to 1906, during which period the output has increased nearly tenfold, having reached a production for the year past valued at $24,980,546, or more than double what it was in 1899.

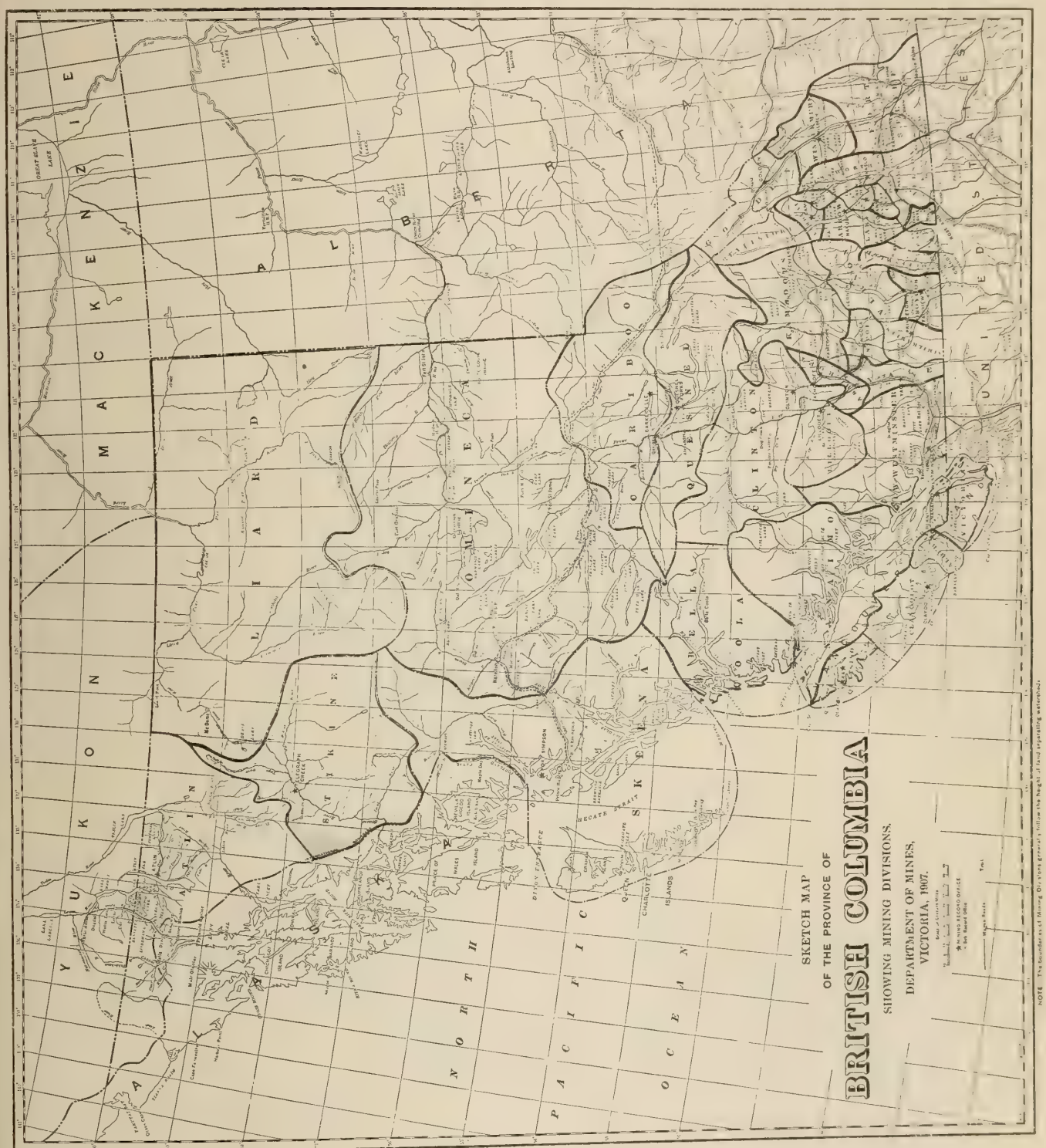

SKETCH MAP
OF THE PROVINCE OF
BRITISH COLUMBIA
SHOWING MINING DIVISIONS.
DEPARTMENT OF MINES,
VICTORIA, 1907.
YUKON
MACKENZIE
ROCKY MOUNTAINS
PACIFIC OCEAN
UNITED STATES
QUEEN CHARLOTTE ISLANDS
HECATE STRAIT

TABLE IV.—AMOUNT AND VALUE OF MINERAL PRODUCTS FOR 1904, 1905 & 1906

MINERAL	Custom'ry Measure	1904		1905		1906	
		Quantity	Value	Quantity	Value	Quantity	Value
Gold, placer	Ounces	55,765	$ 1,115,300	48,465	$ 969,300	.....	$ 948,400
Gold, lode.....	"	222,042	5,589,608	238,660	4,933,102	224,027	4,630,639
Total Gold.			$ 5,704,908		$ 5,902,402		$ 5,579,039
Silver	Ounces	3,222,481	$ 1,719,516	3,439,417	$ 1,971,818	2,990,262	$ 1,897,340
Lead.....	Pounds	36,646,244	1,421,874	57,580,703	2,399,022	52,408,227	2,667,578
Copper	"	35,701,128	4,578,037	37,692,251	5,876,222	42,990,488	8,288,565
Zinc	Tons	.....	.....	9,413	139,200	654	17,100
Total metalliferous			$13,424,335		$16,288,664		$18,449,602
Coal	Tons	1,253,628	$ 3 760,884	1,384,312	$ 4,152 936	1,517,303	4,551,900
Coke	2,240 lbs.	238,428	1,192,140	271,785	1,358,925	199,227	996,135
Other materials .	"	.....	600,000	.....	660,800	.....	982,900
Total production		.....	$18,977,359	....	$22,461.325	.....	$24,980,546

This table gives the amounts, in the customary units of measure, and the values, of the various metals and other minerals which go to make up the grand total of the mineral production of the Province for 1906, and also for purposes of comparison, similar data for the two immediately preceding years.

The table shows that in 1906, as compared with 1905, there was a decrease in the production of placer gold of some $20,900 and of lode gold $302,463, making for this metal a total decrease of $323,363.

The amount of silver produced in 1906 was 2,990,262 ounces, having a gross value of $1,897,320, a decrease from 1905 of $74,498, due chiefly to the decreased production of the Slocan district.

The table also shows an output of lead in 1906 amounting to 52,408,217 pounds, valued at $2,667,578, which, although a decrease from the production of the last preceding year of 4,172,480 pounds, is still greater than that of any other year since 1900, but owing to the greatly increased market value of the metal, and in spite of the materially decreased amount produced, the value of the product for 1906 shows an increase over that of 1905 of $268,556.

TABLE V.—PRODUCTION OF MINERAL BY DISTRICTS AND DIVISIONS.

NAME	DIVISIONS			DISTRICTS		
	1904	1905	1906	1904	1905	1906
CARIBOO DISTRICT	.....	.....	.....	$ 474,600	$ 406,000	$ 405,400
Cariboo mining division	$ 313,000	$ 300,000	$ 355,800			
Quesnel mining division	150,000	96,000	39.000			
Omineca mining division	11,600	10,000	10,000			
CASSIAR DISTRICT	.....	.....	.....	558,573	504,372	556,599
EAST KOOTENAY DISTRICT	.....	.....	.....	3,210,573	5,339,154	5,171,024
WEST KOOTENAY DISTRICT	.....	.....	.....	5,806,070	5,421.859	4,660,352
Ainsworth mining division.....	168,023	100,273	268,111			
Nelson mining division.....	466,683	532,564	515,709			
Slocan mining division	1,236.858	970,344	532,228			
Trail Creek mining division	3,760,866	3,672,878	3,213,587			
Other parts.....	173,640	145.650	120,717			
LILLOOET DISTRICT.....	.....	.....	... .	34,583	32,584	20,314
VALE DISTRICT.....	....	.....	.....	4,190,291	6,483,504	8,779,711
Osoyoos, Grand Forks and Greenwood divisions	4.110,366	6.356,410	8,698,470			
Similkameen division.....	2,500	1,533	2,624			
Yale division	77,415	125,461	78,617			
COAST DISTRICTS (Nanaino, Alberni, Clayoquot, Quatsino, Victoria)	....	.....	....	4,702,679	4,273,852	5,388,146
				$18,977,359	$22,461,325	$24,980,546

Table V. shows the proportions of the total mineral production made in each of the various districts into which the Province is divided. It will be noted that in 1906 the Boundary (Yale) district again has the honor of first place, followed in order of output by the Coast district and East Kootenay, with West Kootenay, for many years the Province's greatest producer, only fourth on the list. The Coast and East Kootenay districts, however, owe a considerable percentage of their outputs to the coal mines situated within their limits, whereas in the other districts the production is entirely from lode mining.

The official comment on other tables published in the report is as follows:—

Table VI., Yield of Placer Gold to Date, gives the statistical record of the placer mines of the Province from 1858 to 1906, and shows a total production of $68,-721,10. The output for 1906 was $948,400—a decrease of about two per cent. as compared with 1905, due to a dry season with a shortage of water for hydraulic mining.

Table VII., Production of Lode Mines, relates entirely to the lode mines of the Province, and shows the amounts and values of the various metals produced each year since 1887—the beginning of such mining in the Province. The gross value of the product of these mines is $119,774,022. The production in 1906 was $17,484,102, an increase over the last preceding year of $2,303,933, or about 15.2 per cent.

Table VII., Coal and Coke Production per Year to Date, contains the statistics of production of the coal mines of the Province. The total amount of coal mined to the end of 1906 is 24,144,633 tons (2,240 lbs.), valued at $72,815,423. Of this there was produced in 1906 1,517,303 tons, valued at $4,551,909, a larger amount than had been produced in any previous year. In these coal production figures the coal used in making coke is not included, as such coal is accounted for in figures of output of coke.

The amount of coal used in making coke in 1906 was 381,773 tons, from which was produced some 199,227 tons of coke, worth $996,135, a decrease of some 72,558 tons from the total of coke produced in 1905. These figures are to a certain extent misleading, however, as in 1905 some 3,694 tons of coke were put into stock, whereas in 1906 all the coke made was sold, together with 11,670 tons taken from stock, making the total coke sales for the latter year 210,897 tons. The production of coke in 1906 would have been much greater than it was but for the very urgent demand for coal and the general scarcity of labor, which taxed the companies' resources to keep up a sufficient supply of coal. A strike at the Crow's Nest Pass collieries in the autumn also greatly diminished the output.

Table IX., Production of the Metalliferous Mines, gives the details of production of the mines of the Province (excepting coal mines) for the years 1903, 1904, 1905 and 1906, and the districts in which such productions were made, showing the tonnage of ore mined in each district with its metallic contents and market value. The total tonage of ore mined in the Province during 1906 was 1,963,872 tons, having a gross value of $19,432,502.

The following table shows the percentages of such tonnage and values derived from the various districts of the Province:—

	Tonnage, Per cent.	Values, Per cent.
Boundary (Yale) district ...	60.2	44.2
Trail Creek (Rossland) mining division	14.2	16.3
Fort Steel (East Kootenay) mining division	9.2	15.1
Slocan district	0.8	2.7
Coast district	11.1	6.5
Miscellaneous and other districts	4.5	15.2
	100.0	100.0

Table X., Comparative Mineral Production, compares graphically the output of mineral products in British Columbia with that of similar products in all the other Provinces of the Dominion, and shows that in 1906 British Columbia produced of the metals an amount over 757. of that of all the other Canadian Provinces combined.

VEIN FORMATION AT COBALT, ONTARIO

By J. B. Tyrrell, Mining Engineer, Toronto, Ont.

At the meeting of the Canadian Mining Institute, held in Toronto last spring, Dr. C. R. Van Hise, of Madison, Wisconsin, delivered an instructive address on "The Ore Deposits of the Cobalt District," in which he emphasized the facts already pointed out by Messrs. Campbell, Knight, and others, that there is a distinct and regular sequence in the order of segregation of the various ores in the veins, the cobalt and nickel ores being segregated out first, while the silver ores were introduced at a later date.

Speaking of the silver ores, and of the probability that they again might have been introduced at two separate and distinct periods of time, he said: "To what extent are the rich deposits the result of one segregation under comparatively deep-seated conditions, and to what extent of two segregations, one under deep-seated and the other under shallow conditions? Did the shattering which resulted in the entrance of the silver solutions occur under deep-seated conditions, so that the silver of the rich shoots was deposited as a closing episode of practically one continuous period of concentration? Or, after the first concentration was complete, did the shattering then occur, and the later enrichment take place under comparatively shallow conditions, the two periods of concentration being separated by a long interval? Whatever is the final answer to the above question, it appears certain that the extremely rich superficial deposits of a few feet in thickness, connected directly with the zone of weathering, are due to secondary concentration under surface conditions. I refer to the nugget horizon, which is so rich in silver, and in which the smaltite and cobaltite have been largely altered into secondary minerals, or have been leached out altogether. It is practically certain that this extraordinarily rich upper film in the Cobalt district has been produced by two concentrations, one under deep-seated

conditions, when atmospheric waters were not present, and the other under surface conditions, when atmospheric waters were present."

Again, "I believe that the extremely rich upper silver belt, so characteristic of the district, is unquestionably the result of two concentrations, the latter of which is accomplished through the agency of atmospheric waters."

Thus two distinct periods of time are here clearly



designated for the deposition of the silver ores, namely, an earlier one under deep-seated conditions away from the presence of atmospheric influences, and a later one under surface conditions, though both of these segregrations are secondary as compared to the prior segregration of the cobalt and nickel ores.

Dr. Van Hise also agrees with Professor Miller and others that the post-Huronian diabase which is known to underlie large areas within the district is the original source of the ore, and also that this diabase has the form of a horizontal sill or laccolith, rather than of a series of huge dikes or batholitic masses which spread out and increase in size as they descend, and that it rose through fissures or vents in the older rocks of Keewatin, Laurentian or Huronian age, until it reached and was stopped by some more resistant layer, through which it was unable to penetrate, and so was forced to spread out horizontally beneath it.

Professor Miller has also shown, in a paper published in the first number of this JOURNAL, that the mineral-bearing veins "appear to have been formed when the cooling of the diabase was taking place. On cooling, the diabase would contract, producing fissures, not only in its own mass, but also in the rocks with which it was in contact, or which lay adjacent to it."

It will be interesting to consider some of the effects on the form and richness of the mineral-bearing veins of the Cobalt district which would seem to follow as natural and logical results from the conditions outlined above. If the conclusions here reached do not harmonize with the conditions that may be found to occur in the mines by the managers and superintendents who are operating them, any corrections and emendations will be gladly welcomed.

At the time when the laccolith was being formed the molten diabase, after rising for a certain distance through the older and already consolidated rocks, would seem to have met a more resistant layer which obliged it to spread out horizontally along planes of weakness in these rocks and form extensive flat-lying sheets. By the injection of this fluid sheet or lens the superincumbent rock was raised to a certain extent.

The liquid diabase was, of course, very hot, and the heat from it was communicated to the rocks above and below it, and these in their turn would expand with the increase in temperature, but on account of difference in texture and composition the heat would be absorbed differently by different bands, and the expansion would consequently be unequal, so that joints, fissures and shearing planes would be formed.

After the intrusion of the diabase had ceased, it would gradually begin to cool and harden. As it cooled it would contract, and fissures would form in the parts that had consolidated, but while there was any portion of the mass still fluid these fissures would probably be filled from the fluid interior. The fissures occupied by the present veins were therefore formed subsequent to the solidification of the whole mass

After the mass had solidified, as it and the adjoining rocks gradually cooled they would necessarily contract, the contraction amounting to about 9 inches in 1,000 linear feet for every decrease of 100 degrees centigrade in temperature. This contraction would cause the formation of many irregular fissures normal to the plane of heating and cooling, or in this instance approximately vertical. The fissure would be widest and most extensive either in the diabase itself, or in the surrounding rock wherever this was in immediate contact with the diabase, where the heat had been most intense, and where the subsequent cooling and consequent shrinkage was also greatest.

The rock above the laccolith, extending from it to the surface of the earth, would lose its heat and cool comparatively quickly, and on this account it is hardly probable that it became very hot to any great distance from the diabase. Therefore the cracks and fissures wards more or less at right angles to it, would all be short and very shallow. They would, of course, be that were formed by contraction on cooling in the thin heated layer near the diabase, and that extended out-



widest close to the diabase where the heat and subsequent decrease in temperature had been greatest, and would quickly contract and disappear altogether at a short distance from it. If mineral-bearing solutions in ascending from the heated interior of the earth reached this zone, the fissures were probably filled by such minerals as are known to have been deposited first throughout the district, such as calcite, smaltite, cobaltite, niccolite, etc., but the silver ores, which are

here the products of a later segregation, would probably be absent.

The rocks that underlay the diabase, whether Keewatin greenstone, Laurentian granite or Huronian conglomerate, would be heated by it like the rocks above it, but as the cooling took place largely by radiation of heat from the surface of the earth, and as the laccolith now lay between these underlying rocks and the surface, the cooling would progress exceedingly slowly, in fact it would not begin at all until the laccolith itself had cooled to the temperature of the rock below it. Then this lower rock would begin to cool and shrink, and as the shrinking continued numerous fissures would be formed, which in the aggregate would certainly be widest and most extensive close to the contact with the overlying diabase, and would pinch out and disappear as they descended, or as they went farther and farther from the diabase.

To what depth the rock was affected by the heat from the diabase and by its subsequent cooling is not known, but it will be a matter of great interest to determine, as the fissures occupied by the veins may be expected to extend to that depth.

As clearly shown by Dr. Van Hise, the fissures so



formed in this zone of shrinkage were first filled by calcite and ores of cobalt and nickel by precipitation or deposition from solutions that had risen from deep-seated sources during the later stages of the diabase eruption, and had circulated outwards through cracks and crevices as far as the influence of the diabase intrusion had reached. These minerals now make up very much the largest part of the contents of the veins, so that the veins were formed almost to their present size, and the walls were almost as far apart as they are now, and consequently the adjoining rock had cooled almost to its present temperature, while this early stage of ore deposition was in progress.

As an accompaniment to the very last stages of the diabase instrusion, silver-bearing solutions rose from deep-seated sources along the igneous vents and spread through and under the mushroom-shaped laccolith along the fissures and veins as these widened slightly with the final cooling and shrinking of the rock, the process being continued until all the channels for the passage of the rising waters were choked.

The veins thus fill V-shaped fissures which extend downwards unknown distances below the bottom of the laccolith, or the former position of the laccolith, and in the aggregate become narrower as they go down.

In applying this rule, however, it should be observed that any individual fissure may be only a part of a complex imbricated series, so that while one may contract, another to one side or the other of it may widen to an almost corresponding degree. The rapid pinching out of one vein in depth should not, therefore, lead to the belief that the bottom of the zone of shrinkage had been reached, but should rather lead to exploration for other so-called "blind veins" in the vicinity.

After the veins had thus been formed by segregation from waters of magmatic, or at all events of deep-seated origin, there was a very long period of time during which the earth's surface was here subjected to the influence of atmospheric agencies, and was gradually eroded away. Much of the rock which originally covered the diabase laccolith was thus removed, and doubtless large blocks of the diabase itself were also worn away, uncovering the rocks which underlay it over areas of unknown extent. At the same time many veins holding ores of cobalt and silver were cut into, and exposed to meteoric influences, so that the oxygenated surface waters percolated downwards into them, and leached the silver from their decomposed uppermost portions, redepositing it a little lower down near the zone of groundwater. This process went on continuously as the surface was gradually removed, and the level of groundwater was lowered, and in this way an abnormally rich zone was constantly present in the veins a short distance below the surface. This is the later "secondary enrichment" spoken of by Dr. Van Hise.

As the long period of denudation was drawing to a close, during which erosion, solution and concentration had been almost constantly at work, the Glacial period set in. A vast sheet of snow and ice then moved southward across the country, and cleaned off and swept away the decomposed rock that for long previous ages had everywhere formed the uppermost layer of the surface of the land, and left the greatly enriched parts of some of the veins either exposed to view, or merely covered by a thin layer of boulder clay.

In summing up the evidence, more especially in regard to the veins in the conglomerate and other rocks beneath the diabase, it would thus appear:—

That these cobalt and silver veins were formed in V-shaped fissures which taper from above downwards;

That though they were formed by mineral-bearing waters which rose from deep-seated sources, and were associated with the latest stages of the eruption of diabase, having probably risen through the same vents with it, these waters spread out laterally through cracks and openings in the mushroom-shaped top of the laccolith of diabase, and descended into the fissures in the rocks beneath it;

That thus the veins were originally formed by deposition from waters which locally descended from above, rather than ascended from below, as in most normal veins;

And finally that the veins were superficially enriched at a later period by atmospheric waters descending through portions of the veins which have since been eroded away.

TORONTO MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS

The proceedings of the Institute were formally opened on Tuesday afternoon, July 23rd, in the banquet hall of the King Edward Hotel. The delegates were met at the station by a reception committee consisting of Dr. W. G. Miller, Mr. J. B. Tyrrell, Mr. O. N. Scott and Mr. J. C. Murray.

At the afternoon session Mr. John Hays Hammond, the president, occupied the chair. In the absence of His Worship, Mayor Coatsworth, Alderman J. J. Graham read a brief address of welcome.

The secretary of the Institute, Dr. R. W. Raymond, was presented with a portrait of himself. This mark of appreciation was contributed to by members of the Institute from all quarters of the globe. Dr. James Douglas made the presentation. His speech was singularly happy. Dr. Raymond replied in a brief but most characteristically felicitous speech.

It was then announced by the secretary that Dr. Charles D. Wolcott, late Director of the United States Geological Survey, and now secretary of the Smithsonian Institute, had been unanimously elected an honorary member of the American Institute of Mining Engineers.

Papers were read by Professor W. P. Blake, on "The Destruction of the Salt Industry at Salton Lake, California," and by Dr. James Douglas, on "Some Reflections on Secrecy in the Arts."

In the evening a reception was held at the Parliament Buildings. The Hon. Mr. Cochrane occupied the chair, and Chief Justice Moss, Acting Lieutenant-Governor, welcomed the visitors on behalf of the Province of Ontario. The Hon. Mr. Foy, Acting Premier, also spoke briefly. Mr. John Hays Hammond, in an incisive and brilliant reply to the welcome, spoke appreciatively of Canadian mining engineers. Dr. R. W. Raymond and Dr. James also spoke. Refreshments were then served in the west wing of the building.

Wednesday's proceedings consisted in the reading of several papers. The ladies of the Institute were taken for a tour of inspection by the civic authorities. In the evening the whole party left for Cobalt.

As these meetings are being held just as THE CANADIAN MINING JOURNAL is going to press, it is impossible to give a full account of the proceedings. In our issue of August 15th we shall, however, publish a full and accurate account of all the meetings, both in Toronto and elsewhere.

It is noteworthy that never before has Toronto been visited by such a body of distinguished mining men. The Provincial authorities and the City Council, fully realizing the importance of the occasion, have spared no effort to make the visit of the American Institute of Mining Engineers a memorable one. The tone of all the meetings has been high, as is to be expected from a society whose officers are men of such lofty attainments and ideals. The series of meetings, entirely apart from the commercial aspect of their advertising value, will do much to educate the mining men of this Province.

ELECTRO METALLURGY

At the recent meeting of the Engineering Conference of the Institution of Civil Engineers, in Great Britain, the subject of the progress of electro-metallurgy was very ably discussed in a paper presented by Mr. Bertram Blount, A.I.C.E. After referring to the recent improvement in methods, it is pointed out that the subject of electro-metallurgy was not so long ago so special that few were able to judge whether a process was likely to be successful or not. Now, however, it is being studied like any other branch of chemical engineering, its principles are well understood, and the result is that processes which may be of considerable laboratory interest, but are plainly unworkable commercially, are disregarded, and the energy and money formerly wasted on these are directed to those which may be made a commercial success. The principal electro-metallurgical industries at present are, the author states, the refining of copper, the greater part of the world's output being refined electrolytically, and the manufacture of aluminum, of sodium and of steel. The latter, it is opined, will eventually become the largest of all electro-metallurgical industries; but, at present, only a beginning has been made in the development of suitable methods. We quote the following paragraph from the paper itself: "Much delay in arriving at the present status has occurred because for years inventors tried to smelt iron instead of manufacturing steel from iron already smelted in the blast furnace. Now, however, attention is turned to steel-making as a more easily attainable end, with the results that already steels of high grade can be successfully prepared in electric furnaces of various type—the Heroult and the Kjellin representing two of the most distinctive and promising. Probably, in the first instance, the electrical method will have its greatest measure of success in preparing steels of such high grade that any extra cost will be quite outweighed by the certainty that the metal will absorb no impurity in the course of manufacture. But as methods are cheapened it may well be that every grade of steel now prepared in open hearth furnaces will be prepared in corresponding furnaces electrically heated. The power necessary should be obtainable from blast furnace gases, for after a liberal allowance for heating the blast and for the blowing engines, hoists and subsidiary gear, there is certainly an ample surplus, provided modern power plant is installed."

Another author of a paper read at the meeting refers to the electro-metallurgical experiments carried out in Canada under Government auspices, and states that three important points have been decided thereby: (1) that charcoal, even of inferior quality, can be satisfactorily used in the electric furnace without briquetting; (2) that ores containing a considerable percentage of sulphur and practically no manganese can be used to produce low sulphur pig iron; and (3) that magnetite offers no special difficulties for treatment by this method.

THE MINING AND SMELTING EQUIPMENT OF THE CANADIAN COPPER COMPANY.

By David H. Browne.

The last three years have been, for the Canadian Copper Company, a period of transition. In 1902, when this company was absorbed by the International Nickel Company, the smelting plant at Copper Cliff consisted of two furnace buildings, which had grown by accretions and additions, covering a number of small Hereshoff furnaces, all of which were fed by hand, and each was independent of the others. These furnaces produced a matte containing from 30 to 40 per cent. of copper-nickel, which was shipped a mile away to an auxiliary company, known as the Ontario Smelting Works. Here the matte was ground in a ball mill, roasted in long calcining furnaces, briquetted and smelted in brick cupolas to a matte containing from five to eight per cent. of iron.



Creighton Mine—Open Pit.

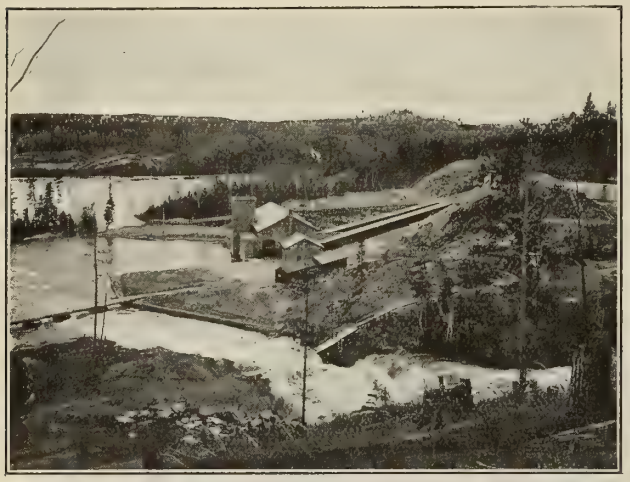
This procedure, as might be expected, was inefficient, and it was decided to consolidate the furnace work and the refining in one plant and to go back to the Bessemer process, which had been formerly used. Consequently, in 1903, a new furnace building was erected, and two modern furnaces 50 x 204 inches were installed. The matte from these furnaces was blown up to 80 per cent. copper-nickel in the same building in three converter stands. All this equipment was steam driven. In 1904 it was decided to make use of the water power on the Spanish River, owned by the Huronian Company, and in that year Messrs. Ross & Holgate, of Montreal, took charge of the construction of the dams and the installation of the machinery to generate the power required and to transmit it to the smelter at Copper Cliff.

The High Falls of the Spanish River is about four miles north of the town of Nairn, on the Soo branch of the Canadian Pacific Railway, and about 25 miles from Copper Cliff. In the spring of 1904 a railway was constructed from the Canadian Pacific Railway to the falls, and a camp was erected for the workmen. This preliminary work was done during the summer of 1904, and the construction of the dams and power house was begun in the fall of that year. The Spanish River at this point flows in two channels around a high, rocky island, about 2,000 feet long by 900 feet wide, falling about 65 feet in its passage. As this island rises some 75 feet above the upper level of the river, the engineers found it advisable to make use of this island as part of their system of dams, cutting out a large forebay at one side of the island and so gaining a total head of about 85 feet between the upper and lower water levels. This construction was also advisable in order to drown out a series of rapids which obstructed the river above the falls. The raising of the water twenty feet by this construction forms a storage basin about six miles long, and avoids the danger of "frazil" or mushy ice, which forms in the neighborhood of rapids.

Work on the dams was carried on throughout the winter of 1904-5, in weather sometimes as low as 30 below zero. Some very interesting problems were met by

Messrs. Ross & Holgate, and their solutions of these is told in a paper read at the meeting of the Canadian Institute of Civil Engineers, in April, 1907, from which the following passage is quoted:—

"Though a large part of the concrete work in dams and also in the power house foundations was done in winter, no difficulty was found in securing good concrete work, the only precaution taken being to heat the mixing water by turning a three-quarter inch steam pipe into the barrel supplying the mixer, and during the process of mixing to use a jet of live steam in the mixer,



High Falls Power House

keeping the cylinder closed by wooden coverings during the process of mixing. No attempt was made to heat sand, or stone, nor was such at all necessary. In all the winter work care was taken to use only cement which would attain its initial set in not more than sixty-five minutes, and the results obtained have been absolutely satisfactory."

The power house at High Falls is a concrete and brick building 106 feet long and 55 feet wide in the main, with an extension along one side 24 feet wide containing the transformers and a wing 35 feet square at one end containing a storehouse and heating plant. In this building provision is made for four penstocks 9 feet in diameter, through which water enters to the turbines at a maximum speed of 7.2 feet per second. Two turbines are at present in operation, and a third will be installed during the summer of 1907. These turbines, made by the I. P. Morris Company, of Philadelphia, are designed for a maximum of 3,350 horse-power each. Direct connected with each turbine is a 2,000 kilowatt generator, made by the Crocker-Wheeler Company.

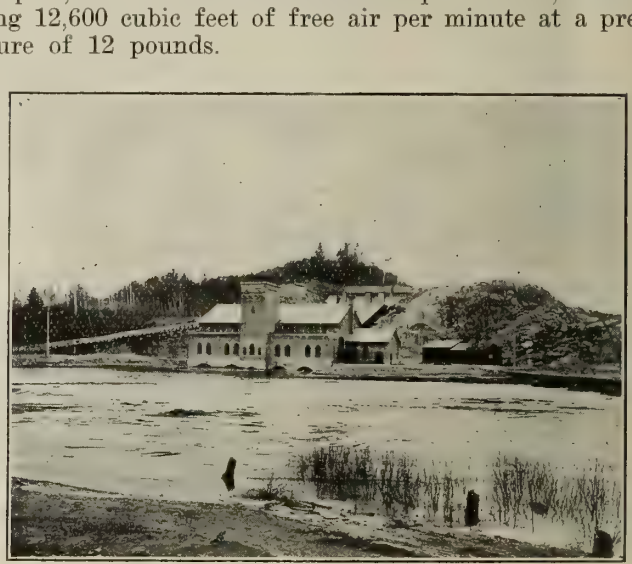
The effective head of water is 85 feet, and the speed of the turbines and generators is 375 revolutions per minute. These generators produce 2,000 kw. current at 2,400 volts, 3-phase, and 25 cycles. Space is provided in the power house for four such units, two of which were put in operation in February, 1906, and the third is at present under construction, leaving the fourth for future installation. When these generators were completed one was tested against the other by reversing the direction of rotation of the second and using it for a time as a turbine pump operating against the full head of water. In this way each machine was tested under varying brake loads.

The switchboard, installed by the Westinghouse Company, occupies a sloping marble table in front of the operator, on a platform about ten feet above the floor. In front of this table are pillars carrying the necessary volt and ammeters, and other recording instruments, so that the whole output of the machine is recorded in front of the operator.

Two groups of three transformers are at present installed in the transformer chamber behind the switchboard. These raise the pressure to 35,000 volts, at which tension it passes through the tower to the transmission line.

This line follows the Soo branch of the C. P. R., on a private right of way, and owing to the necessary curves, is about 29 miles in length. It consists of two three-phase circuits of No. 1 wire, supported on a cross-arm on and between two poles. But one line is in operation at a time, provision being made for throwing the load from one to the other line in case of accident or repair. The insulators were tested at the start at 70,000 volts, and the transmission has given no trouble except in two or three cases where the insulators have been accidentally or maliciously broken.

At Copper Cliff this transmission line enters the sub-station, a concrete building 203 feet by 100 feet, and is there stepped down to a proper voltage for the various electric motors. In this sub-station are installed three Nordberg radial valve blowing engines, while a fourth similar engine is being constructed at present. These engines are rope driven by Allis-Chalmers-Bullock induction motors of 600 horse-power working at 2,200 volts. These motors are arranged to work at three speeds, so that the volume of air delivered to the furnace is under control. The engines are duplex, 42 inch stroke, 70 inch piston diameter, and deliver 320 cubic feet of free air per revolution. The blast for the Bessemer converters is furnished by a Nordberg blowing engine, rope driven by an Allis-Chalmers-Bullock 500 horse-power induction mo- for running at a constant speed of 375 revolutions per minute. This blower is 36 inch stroke, 40 inch diameter, duplex, and runs at 100 revolutions per minute, delivering 12,600 cubic feet of free air per minute at a pressure of 12 pounds.



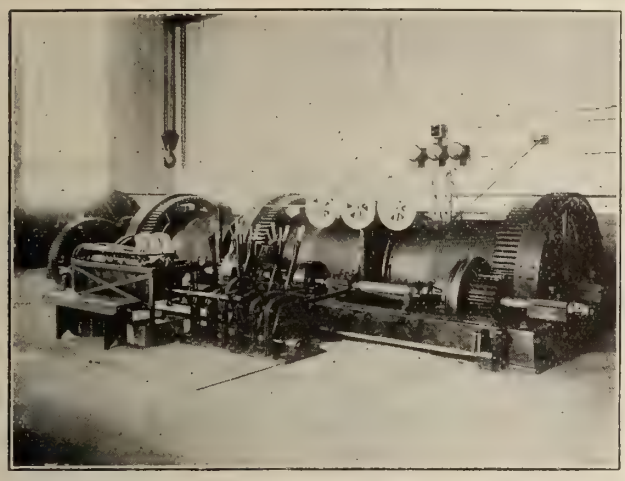
Power House at Crean Hill.

For air hoist on furnace doors, for running drills, and for similar mechanical work, a 100 lb. air compressor, made by the Laidlaw-Dunn-Gordon Company, is provided. This is 25 inch stroke, 15 inch diameter on the high pressure cylinder, and 24 inch diameter on the low pressure side, and is direct connected to an Allis-Chalmers-Bullock induction motor of 300 horse-power, running 125 revolutions per minute at 2,200 volts. The motive power for the electric locomotives which take the trains of ore from the ore bins to the furnaces is furnished by

one 40 kw. motor generator set which takes 550 volts, 40 amperes, alternating current, and delivers 250 volts, 100 amperes, direct current.

The alternating current arc lighting system used for street lamps is supplied by a 75 kw. frequency changer set, in which the 25 cycle current from the transformers is changed to 60 cycles, as required by the arc lamps.

The blast from the three Nordberg air compressors is carried through 36 inch pipes on an overhead system of supports to the furnace building, which adjoins the sub-station. The furnace building is 357 feet long and 85



Interior Crean Hill Engine House—Hoisting Plant.

feet wide. It covers at present three cupola furnaces, four converter stands, and the relining platform, but these converter stands and their lining machinery are in this building merely as a temporary expedient during the erection of the main converter building. The furnace building is designed to cover five cupolas, of which two have been in operation since July, 1904, and the third has been in blast since April, 1906, and two more are under construction. These cupolas stand in a row down the centre of the building, having on one side two standard gauge tracks for the disposal of furnace slag, and on the other side a 32 foot crane span, on which two 50 ton cranes attend to the handling of furnace matte to the converters and of Bessemer matte from the converters to the casting moulds.

The platform on which stand the settlers is 10 feet above the floor of the smelter building. On this rise the concrete bases of the furnaces, so that the hearth plates of the furnaces are 6 feet 6 inches above the tapping platform. The furnaces are 50 inches by 204 inches at the tuyeres, and consist of two tiers of water jackets, the lower or tuyere jackets being 8 feet 6 inches and the upper or top jackets being 6 feet in height. The total height from the lower floor of the furnace building to the charging floor is 35 feet, and the total jacket height of the furnaces is 14 feet 6 inches.

Each of the tuyere jackets contains four six inch tuyeres, which are bushed down to four inches. The side tap is notched out of one of the middle tuyere jackets on the crane side, and is filled with a water cooled cast iron side tap jacket 10 inches x 24 inches.

The furnace slag flows off at the back of the settler into cast iron slag pots, each holding 22 tons. These slag pots are made in sections, with four side pieces and a separate bottom piece. The train of three slag pots is handled by a yard locomotive, and poured over the slag dump.

Matte from the settlers is tapped as required into cast steel ladles 5 feet high and 5 feet in diameter. This is picked up by the electric crane and poured into the converters.

Four converter stands are provided, and three are in use all the time. The shells are 7 feet by 10 feet 6 inches inside, and revolve in tread rings 7 feet 8 inches in diameter. The lining is the ordinary mixture of white quartz and local clay, as there is no quartz in the neighborhood containing copper or precious metals. The blow in the Bessemer converter is carried on in exactly the same manner as in blowing for blister copper, except that the operation is stopped as soon as the iron is eliminated. It is a curious point that copper-nickel behaves as one metal in the converter, and that the ratio of elimination of sulphur and iron in these mattes has exactly the same relation to the amount of copper-nickel present as the elimination of these elements in ordinary copper work has to the amount of copper present. The point of elimination of iron is readily known by the color of the flame, and when this shows that nickel has begun to slag, the converter is turned down and the matte cast into a ladle which is poured by the crane into iron moulds. This matte contains about 80 per cent. copper-nickel.

The charges are brought to the furnaces by three trains of seven or eight cars each. These are accurately weighed before leaving the ore bins, and the amount of flux adjusted to the ore under treatment. Some ores, such as Creighton, require silica; others, as Crean Hill, sometimes require lime; in each case the endeavor is to produce a fluid slag which shall carry as little copper-nickel as possible. Slag from the converters, as well as all scrap and cleanings from the cupolas, are returned to the ore bins. These ore bins are parallel with the furnace building, and 200 feet behind it. The roast ore from the roast yard, green ore from the mines, slag and scrap from the furnaces, coal and coke, quartz, clay and limestone are all delivered on the upper tracks of the ore bins, 35 feet above the charging floor. The ore bins are 700 feet long and 35 feet wide. This makes a row of bins



General View of Cupola Building.

about 30 feet wide inside, and sub-divided into pockets the length of which differ according to the contents and amount of each substance handled. Ore from the roast yard is handled from the roast beds by a steam shovel into Ingoldsby drop bottom cars, which can be dumped readily into the bins.

The ore and other furnace supplies are drawn from the bottom of these bins by means of curved bin gates actuated by a sectional gear wheel and crank. These are spaced at intervals of six feet above two tracks, on which run the charging trains. These tracks form an

oval one-third of a mile in circumference, and pass on each side of the furnaces, allowing the cars to be dumped directly into the cupolas. At a tangent from the curve at one end of the charge track, a line branches off to the sample house. The same cars used in charging the furnaces are used to carry the samples of ores, slags, etc., to the sample house bins, twenty-four in number. On the floor below these sample bins, small end dump cars are used to bring samples to two crushers, from which the ore is automatically sampled and passed through the various fine-grinding machines. The revert or discard from the samplers is collected in a bin, from which it is dumped into charge cars and taken back to the furnaces.

The steam power house, which at present is idle and kept mainly as a reserve in case of any break-down in the electrical equipment, lies to the north of the furnace building and 150 feet distant from it. It consists of a brick building, 156 feet by 101 feet, containing the boilers and blowing machinery, which were used to operate two blast furnaces before the electrical equipment was installed. The water supply from two small lakes a mile and a half northeast of the smelter is slightly acid, containing about 10 to 25 parts of sulphuric acid, or acid salts per million. This is due to sulphur gases from the roast heaps. The water is therefore treated with alkali in a purifying system before passing to the boilers.

There are four Altman-Taylor boilers, each of 400 horse-power. The coal bins are below the charging tracks, and the same train which supplies the furnaces carries coal from the main coal storage bins and drops it into small pockets above and behind the boiler room. The coal is thus delivered by chutes within a few feet of the boiler grates.

In this boiler room is a Blake underwriter pump, delivering 1,000 gallons per minute to the fire lines, and three Snow boiler pumps for supplying the boilers. As a reserve there is in this room a Rand air compressor,



Smelter Building and Sub Station at Copper Cliff.

which can supply air at 100 lbs. pressure, in case of accident to the electric driven air compressor in the sub-station. The exhaust steam from the steam blowing engines is condensed by an Alberger barometric compressor 24 inches diameter with 34 foot head, and dry vacuum pump 8 inches by 16 inches by 16 inches running at 120 revolutions per minute.

The steam Bessemer blowing engine, made by Nordberg, of Milwaukee, is 15 inches by 42 inches on the high pressure steam cylinder, and 30 inches by 42 inches on the low side. The air cylinders are both 40 inches by 42 inches. This blower delivers 10,000 cubic feet of free air per minute at 12 pounds pressure or 120 cubic feet per revolution. For supplying air to No. 1 and No. 2 furnaces there are two Nordberg cross-compound blowers. These are 13 inches by 42 inches on the high steam cylinder, and 26 inches by 42 inches on the low steam cylinders, both air cylinders being 57 inches by 52 inches. These deliver each 20,000 cubic feet per minute at 45 ounce pressure. The capacity is 236 cubic feet per revolution. Electric power is generated by two tandem Robb-Armstrong engines 13 inches by 20 inches and 26



Slag Pots—Copper Cliff.

inches by 20 inches, which are direct connected to two Canadian General Electric alternating current generators. Each of these is 200 kw., 600 volts, 192 amperes at 200 revolutions per minute.

The motor generator set which provides direct current for electric charging locomotives, takes alternating current at 550 volts, 40 amperes, and delivers direct current at 250 volts, 90 amperes, with a speed of 1,200 revolutions.

In this building is also an electric lighting plant. All this machinery is steam driven and is at present idle, but is kept in reserve in case of accident to electric machinery in the sub-station.

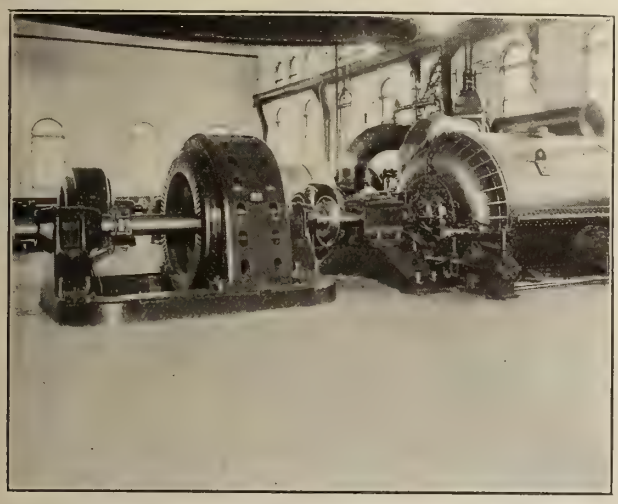
A large Connersville blower is at present under construction for use in this building. This blower has a capacity of 300 cubic feet air per revolution at 60 ounces. This is to be rope driven by two induction motors of 225 horse-power each. It is intended ultimately to replace all the steam driven machinery by electric.

The steam plant has been a valuable reserve at the start, but the new construction involves so much electric machinery that the total power generated by the steam plant would be of little service in case of a break-down of the transmission lines.

The chemical laboratory, to the south of the furnace building and sub-station, was completed during the winter of 1906. The building is of concrete and brick, all the partitions, stairs, floors and ceilings being of concrete and expanded metal. The building is 35 feet by 80 feet. The basement contains a large storage room for acids and a small room for special research work, a glassware store room, a toilet room, and a large dark room with two sinks and eight lockers for photographic work. In the main storage room a Sturtevant fan heating system draws cold air through a steam coil and distributes the warm air throughout the building. A suction fan, of ample capacity, draws the gases downwards through two concrete ducts from the hood in the working room overhead, and discharges them into the

base of a chimney. A system of compressed air pipes runs along one side of this room over the benches on which the acid carboys are stored, and is used instead of the usual syphons for drawing acid and ammonia from stock.

The second floor of the laboratory contains two halls at either end, opening into the main working room, and at either end of these halls are, at one end, an assay room and a sulphuretted hydrogen room; at the other end, a balance room and an office. The main room is 41 feet 3 inches by 21 feet 6 inches, and is open clear to the tile roof. Above each hall, at either end of this main room, is a ventilating passage leading to two circular fans with electric motors, which in this way gather all the gases which rise in the peak of the roof and discharge them through two circular openings in the outer gables.



Interior of High Falls Power Plant.

The hood is 16 feet by 5 feet in size and 9 feet high. It is covered on top and the sides with heavy wire meshed glass, and is divided by concrete walls, which rise about a foot above the hearth, into three compartments. The suction fan in the basement maintains a very powerful down-draft through ducts in these concrete walls. The hearths are well lighted by a number of incandescent lamps inside the hood, and above the hearth. As the gases are very rapidly withdrawn at a point about a foot above the hearth, there is no corrosion of the lamp sockets or wiring. This hood, being all of glass, with cast iron columns, in no way interferes with the proper lighting of the work benches.

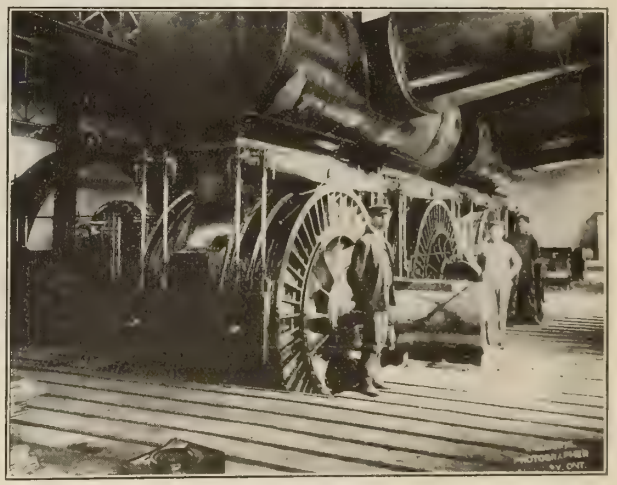
All heat for evaporation and similar work in the hood is supplied by electric hot plates. These are each 12 inches by 18 inches in size and are arranged in groups of eight to cover the hearth of two compartments of the hood. Each plate is connected to a service cable, and is provided with a switch giving three separate temperatures. The lowest heat used is just below the boiling point of water, and is used for slow evaporation. The next heat will boil ordinary solutions, and the highest heat is used for driving off the last trace of sulphuric acid and for baking residues, silicas, and other substances which demand a high temperature. The power used is 110 volts, alternating current, the low heat requiring about 5 amperes, and the highest 15 amperes per plate. The third compartment of the hood contains a concrete hearth with a number of acetylene gas burners, blast lamps, gasoline gas lamps and other apparatus for combustions. Work benches run all around the room on three sides, and two smaller benches lie in the middle of the room at right angles to the hood. The plating bench occupies part of the fourth side, and is supplied with direct current from storage batteries in the substation. The plating of nickel, cobalt and copper is done on series plating frames, the current, density and voltage being regulated by a switchboard in the balance room.

The balance room is 12 feet by 19 feet and contains a heavy bench on concrete piers running down to bed rock with room for five balances. This room is well lighted from the north.

The precipitation of copper, arsenic etc, by sulphuretted hydrogen is all done in a room 12 feet by 15 feet which communicates by a window in the partition with the main work-room. The hoods in this precipitation room are provided with electric hot plates, and are ventilated by one of the fans in the gable. Owing to the care taken in ventilation, it is practically impossible to smell sulphuretted hydrogen, or for that matter any noxious gases in the laboratory.

As previously stated, the furnace building at present in use is intended to cover five cupolas, three of which are at present in operation and two to be erected this year. This will take all the available space in the present building. One of these new furnaces will be blown by a new Nordberg machine similar to those now installed in the sub-station. The fifth furnace will be connected with a large Connersville blower to be erected in the old power house.

To provide for the Bessemer converters, a new building is now under construction. This will be parallel with the present furnace building and sixty feet distant from it. This new Bessemer plant will contain ten converter stands, and will use the new type of Allis-Chalmers converters as described in *The Electro-Chemical and Metal-*



Interior of Sub-Station at Copper Cliff -showing Blowing Engines.

lurgical Industry for June, 1907. This building is of steel and corrugated iron. The crane runway is 35 feet high, the walls 48 feet and the total height to the peak of the monitor is sixty-seven feet.

The main building is 60 feet wide, with a shed 35 feet wide which extends the entire length on the south side and for 112 feet on the north side of the building. The converter department is 280 feet by 60 feet in the main, or by 95 feet including the shed which is used for sculling and matte casting. The relining department is a continuation of the converter department, using the same crane-run. It is 112 feet long, 60 feet wide with a shed 35 feet on each side, making the entire width 130 feet.

Back of this are the storage bins for quartz, clay and old linings, with a floor space 60 feet by 60 feet, and behind this again the machinery for crushing and drying quartz and clay and elevating them to the storage bins. This occupies a floor space of 70 feet long by 60 feet wide. The total length of the building is therefore 522 feet. It is a steel construction, with corrugated iron sides and roof.

Two Morgan electric cranes, 55 feet 8 inches span, with 50 ton main and 20 ton auxiliary hoist, will be used to handle the shells in the lining and blowing rooms.

Furnace matte from the cupola building will be taken across on three tracks to the Bessemer department by means of motors. The matte pots will be lifted and poured by the electric cranes. Owing to the nature of the ground it is not possible to arrange the converter building on a lower level so that the matte can be poured direct from matte cars into the converters. These ten concrete stands are controlled by two pulpits, each handling five stands. The control is entirely electric. Each converter is operated by a 30 horse-power induction motor, with solenoid brake. This is direct connected to a bronze worm which, by two gearings, transmits the power to the drive trunnion of the converter

The slag from the converters is to be poured into steel pots, which are lifted by the crane and set on a slag car, on which it is taken out of the building and poured into a slag casting machine. This casting machine is a circular steel framework 58 feet in diameter, resting on a circular track. On this framework rest cast iron moulds forming a continuous flat ring Each mould is 12 inches by30 inches by 4 inches, and holds about 150 pounds of slag. This ring is slowly rotated under the stream of slag poured down from the slag car. The slow rotation allows time for the slag to cool before the moulds reach a hand controlled tripper, which reverses the mould and drops the material into a hopper. Below this hopper a mine skip takes the slag, carries it up on an incline track and drops it into a steel bin of 500 ton capacity above the charging tracks.

The converter matte will be handled in clay lined ladles by the cranes and poured into moulds under the shed roof. As soon as the lining of a shell is burned out the shell is lifted by the travelling crane and placed on one of the sculling cars which run on standard gauge tracks from the main building, out under the shed roof on the south side. The space between columns in the main buildingis filled with sheet steel doors of the roller blind type, which can be raised and lowered to allow the sculling cars to pass out. After the shells are sculled, the cars are pushed back, and the shells lifted by the travelling cranes and carried to the relining platform.



Smelting Plant from South. Ore Bins in Distance.

Here, they are dropped on cars at each side of a sixty foot platform, twenty-five feet wide and ten feet high. This platform is in the centre of the relining department, with space on each side for five relining cars. Down the centre of this relining platform run two narrow gauge tracks, which bring the mixture of quartz and clay from the Carlin mills.

The lining is done by ramming machines which are handled by jib cranes, three on each side of the platform. The tops are to be lined by ramming around a mould instead of by hand, as at present

As fast as the shells are lined, and the tops are replaced, the lining cars are pushed out under the shed roof, which lies at each side of the relining room. This brings the shells under a row of hoods and along side of a wood storage platform, from which the cord-wood is handled for drying the lining.

When this has been completed, the cars are again

pushed back to the lining platform, the shells lifted off and placed on the blowing stands by the travelling crane, and the cars are ready to receive a fresh shell for lining. The motion of the drying cars back and forth from the lining platform to the drying hoods is effected by ratchet gears on the cars.

The quartz and clay mixture for lining is made up in the crushing department, above which are the storage bins. These bins are of sheet steel and hang from the side and central columns in a catenary curve. There are six bins, one set of three on each side containing, respectively, crushed quartz, dry clay and old converter linings from the sculling shed. On each side below each bin-row are narrow gauge tracks on which run side dump cars which gather the mixture of clay and quartz from the bins and dump it into the mills. These tracks are on platforms five feet above the relining platform level. The crushed mixture is taken from the mills by a plough attached to the side of each pan, which scrapes the mixture off the pan and delivers it into cars which run down the centre of the mill floor and out along the relining platform. In this way the usual wheel barrow work is avoided. Space is provided for six mills, three on a side, each mill being below the level of the tracks which bring the supply of quartz and clay, and above the level of the tracks which take away the crushed and mixed product to the lining platform.

At the rear of the bins and mills are the quartz crushers and clay driers. These occupy a floor space 60 by 70 feet. On either side of this end of the building are standard gauge tracks, on which quartz and clay are brought in. The clay is all passed through a Ruggles-Coles dryer, which removes the moisture and rolls it into the shape of pellets. This is necessary in winter, in order to avoid freezing in the bins. During part of the summer drying is not required.

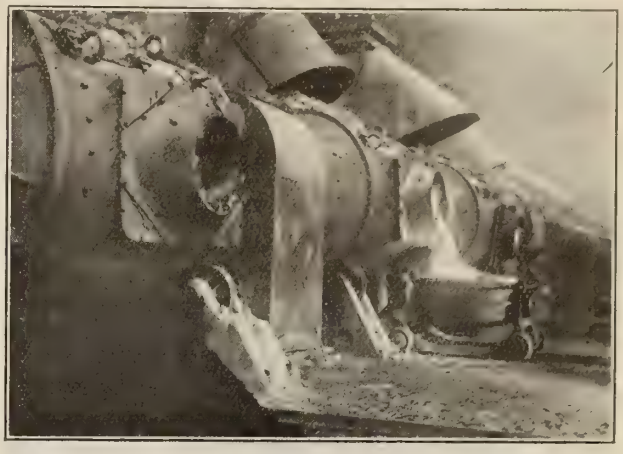
Quartz comes from the quarry in two forms, lumps and screenings. In summer the screenings can be passed



Crean Hill Shaft House and Engine House

direct to the bins. In winter the screenings are wet and frozen, so that they require drying. A small rotating dryer is provided for handling these frozen quartz screenings. The coarse quartz passes from the cars on to a platform, from which it is fed directly into a Blake crusher, elevated by belt to a roll, passed through a dryer, if necessary, and, if not, then elevated to the bins by bucket elevators. The spreading and carrying of material to the proper bins is done by travellings belts.

The ore supply comes at present from the Creighton and Crean Hill mines. The Creighton Mine is well known as the largest body of pyrrhotite carrying nickel and copper that has been opened in the Sudbury district. It lies on the border line between the Townships of Creighton and Snider; the present operations being all in the Township of Snider. The mine is worked as an open pit of oval form about 225 feet from foot to hanging wall. The pit is at this time about 160 feet deep. In the bottom of this pit thirteen tracks converge like the ribs of a fan to an entry on the footwall leading to the inclined shaft. The ore is broken from the side of the open pit in steps, and thrown down to the tracks, where it is block-holed, or broken up and trammed to the shaft.



Converters—Copper Cliff

About 330 feet west of the old shaft, a new shaft has been sunk during the last year, and a raise has been made connecting the bottom of the new shaft with the surface to the west of the present open pit. This will more than double the producing capacity of the mine. During the last year also the entire surface equipment of steam-driven machinery has been removed and replaced by electrical machinery. The sub-station at the Creighton mine contains three transformers of 275 kw. capacity each. These bring the voltage down from 35,000 to 550 volts. There are two hoisting engines, each carrying three drums, which are so arranged that any two can be run in counter-balance, or all three run independently. These hoisting engines are operated by 150 horse-power 3-phase variable speed induction motors. The rope speed is 500 feet per minute, and the capacity is three tons to each skip. The two hoisting engines are set at right angles to each other, the new shaft being operated by a hoist which is parallel with the new rock house. The old rock house and shaft, 500 feet to the east, is operated by the second hoisting engine, the ropes making a turn through sheives behind the old rock house.

The mine drills are supplied by a compound, direct driven compressor, running at 120 revolutions per minute and giving 1,635 cubic feet free air per minute. This is driven by a constant speed 550 volt induction motor of 300 horse-power. The air regulation is obtained by automatic Corliss step valves.

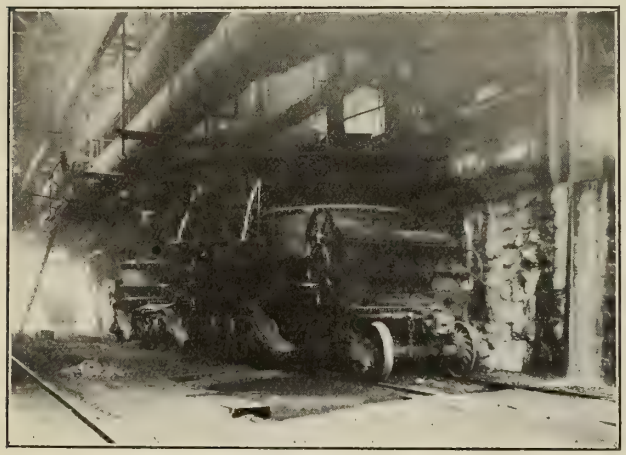
The fire protection equipment consists of a 1,000 gallon 6 inch 4 stage pump, direct connected with a 150 horse-power 3 phase 550 volt induction motor. To supply this a steel tank holding 60,000 gallons is erected just outside the power plant.

The rock house at the old shaft is a wooden structure 42 feet by 46 feet, and 72 feet high. The new rock house at the Creighton is built of reinforced concrete up to the bin floor. Above this the walls are three inch plank, ten inches wide, spiked together. There are three

skip tracks entering this building and delivering the ore over the grizzlies, through which the smaller fragments fall direct into the bins. The coarse ore is fed into two crushers 30 inches by 18 inches. From these the crushed ore passes through revolving screens on to rubber belts 3 feet wide and 50 feet long. Here the rock is picked out and thrown into a rock pocket, while the ore passes over the belt into the ore bins. Two railway tracks beneath the rock house admit the trains on which the ore is taken to the roast yards at Copper Cliff.

The crushers and belts, which are in two sets, are each operated by a 50 horse-power 3 phase 550 volt induction motor, and the mine water is handled by a 100 gallon pump geared to a 15 horse-power 550 volt motor, which operates at 750 revolutions per minute.

For the convenience of the men, a large "Dry" has been built adjoining the shaft house. This building is of brick, 36 feet by 80, and is well lighted and heated. It contains 205 lockers for clothes, three long enamelled iron basins, each fitted with taps for hot and cold water, and in an adjoining room shower baths and water closets are provided.



Back of Furnace—showing Slag Pots

The Crean Hill mine, which has been opened up within the past year, lies in lot 5, concession 5, in the Township of Denison, about a mile and a half northeast of the Vermillion mine. The hill rises sharply from a swamp and shows a number of outcroppings, which are strung out in an east and west line. Extensive diamond drilling operations were conducted before the location of the shaft house was determined. The ore at this mine seems to lie in veins from 50 to 80 feet in width. Whether these veins continue, or whether they overlap, will be brought out by the development of the mine.

The ore contains a larger proportion of pentlandite than the normal ores, and as the rock involved is a mixture of soapstone and greenstones, it requires entirely different treatment from the massive ores found at Stobie and Creighton. A branch line three and one-half miles long has been constructed from the C. P. R. at Victoria Station to the mine. The rock house, Dry, engine houses, etc., at Crean Hill are an exact duplicate of those at Creighton, except that in this case one hoisting engine with three drums is used, as but one rock house has to be considered.

The foregoing description covers the plants at present in operation, or under construction at the Cliff, and the mines, for the treatment of copper-nickel ores.

Plans have been drawn and work will this year be commenced on the new shops at Copper Cliff. These will adjoin the smelter to the south of the present buildings, and will replace the present inadequate buildings which surround the old Copper Cliff mine. The new equipment will consist of machine, blacksmith and foundry shops under one roof, a warehouse and gantry crane storage yard, a large carpenter and pattern shop, and a roundhouse for seven locomotives. It is expected that this construction will be completed before another year, at which time the plant of the Canadian Copper Company will challenge comparison with any smelting plant in the United States or Canada.

IRON MINING IN BRITISH COLUMBIA

It is reported that mining operations are to be resumed at the Texada Island iron mines, the ore from which will be treated at Irondale, near Port Townsend, where a new plant is at present being installed. These mines have been worked intermittently for several years past, the product, which was smelted with a mixture of 1-9 to 3-10 of bog ore, having been marketed in San Francisco, and used in the construction of United States battleships. The property is situated on the southwest of Texada Island and includes some 2,700 acres. The ore mass, which varies in width on the surface from 20 to 25 feet, is an irregular contact deposit between limestone and granite, and may be traced northward along a ridge following the coast line for a distance of nearly four miles. When operations were in progress some years ago it was estimated by experts that the development at that time had exposed an ore body representing five million tons of commercially valued ore in sight. The ore has been analyzed on several occasions in the laboratory of the Canadian Geological Survey, and the following result was obtained from one sample submitted:—

Iron	69.85
Manganese	Trace.
Siliceous matter	2.75
Sulphur	.06
Phosphoric acid	Trace.
Moisture	Trace.

This return, however, was doubtless secured from an exceptionally fine specimen, as it is questionable whether the average of the ore will exceed 50 per cent. metallic iron.

So long ago as 1872-3, the deposit was reported on by Mr. Richardson, of the Geological Survey, who thus describes the geological features of the locality:—

"Three miles northwesterly from Gillies Bay, and about seventy paces from the shore, a small exposure of magnetic iron ore was met with, associated with a cross-grained epidotic rock and grey diorite. Immediately north of this exposure, the ground rises steeply to about 450 feet above the sea. Here on the eastern and south-eastern slopes of the hill, for about 150 feet down and extending from 200 to 250 feet in length, is an exposure of rich magnetic iron ore. On the outcrops, facing to the northwest, the ore bed is seen to be from 20 to 25 feet thick, and to rest on grey crystalline limestone, with which, for about two feet down, are interstratified bands of ore, of from half an inch to one inch in thickness. The hill still rises to the north and northeast, but along the flank, and at about the same elevation in a northwesterly direction for nearly a mile the ore is occasionally seen, and in one place there is a continuous exposure of 250 feet. . . In the concealed intervals the course of the bed appears to be indicated by a coarsely crystalline epidotic rock, carrying ore in places, but with the grey

limestones apparently overlying it to the northeast, and the grey and green dioritic rocks beneath it to the southwest . . . In a northeasterly direction from the first noticed exposure, for a quarter of a mile, no ore is seen, after which it is again found, at first in irregular patches mixed with epidotic rocks, and then its course becoming more noticeable, for more than half a mile the bed presents an irregular surface exposure of from 600 to 900 feet of nearly pure ore."

Dr. Dawson, commenting on Mr. Richardson's report, differs from the latter in respect to the nature of the ore deposit, which he describes as neither a bed nor a true vein, but a contact deposit which has been produced at or near the junction of the granitic mass with the stratified rocks, and more particularly with the limestone.

On the second exposure referred to by Mr. Richardson, development work was concentrated for some time, a shaft being sunk and a cross-cut run into the hill at a depth of 150 feet. Here, after passing through dioritic rock, a very fine body of ore was encountered, over a hundred feet in thickness, and affording a remarkably high return of metallic iron.

In addition to the occurrence noted, another deposit of magnetite occurs on the northeast side of Texada Island, while important deposits are being developed on the west coast of Vancouver Island, and there is every reason to believe that here and in other localities the available resources are sufficiently great to promise an abundant supply of raw material for the up-building of a flourishing and important iron industry on the British Columbia coast, when the conditions are ripe for its establishment, and those conditions are now within measurable distance of fruition.

DR. EDWIN GILPIN

Dr. Edwin Gilpin, Deputy Commissioner of Mines for Nova Scotia, died on July 10th after a few days' illness.



The late Dr. Edwin Gilpin.

Dr. Gilpin was born in Halifax, N.S., in 1850. His father, the late Rev. Dean Gilpin, was for years a successful teacher, and throughout his long and useful life a distinguished and ardent worker in the Church of England. Dr. Gilpin's grandfather was the Hon. T. C. Haliburton, known to the world of letters as "Sam Slick." On his father's side, Dr. Gilphin could claim descent from Richard de Guylpyn, who flourished in 1206 in Westmoreland, England.

Edwin Gilpin, Jr., graduated from King's College, Windsor, N.S., in 1871. From the same University he received the degree of A.M. in 1873, his course being a special one in mining, geology and chemistry. During his college course he began the practical study of mining engineering. At the Albion collieries of the General Mining Association, in Pictou County, he gained his first mining experience. Later he visited extensively the leading mining districts of Great Britain.

In 1874 he was elected a Fellow of the Geological Society of London, England. His membership of the Nova Scotia Institute of Natural History dates from 1873. To this institution he has always been a source of help and support.

In 1879 and 1881 he was successively appointed Inspector of Mines and member and secretary of the Board of Examiners of Colliery Officials for the Province of Nova Scotia. In 1885 he was elected a member of the American Institute of Mining Engineers, and in 1886 he received the appointment of Deputy Commissioner of Works and Mines. This position he held until the time of his death.

Dr. Gilpin, during his active life, contributed scientific papers, many of them unique sources of information, to the transactions of the leading societies in Great Britain and America. The annual reports of the Mines Department to the Government of Nova Scotia were issued under his direction.

BOOK REVIEWS

"Electric Blasting Apparatus and Explosives: With Special Reference to Colliery Practice," by Mr. Maurice, Mining and Electrical Engineer, London. "The Electrician" Printing and Publishing Company, Limited. Salisbury Court, Fleet street; pp. 166; price, 8s. 6d. net.

This much-needed book was written in the hope that it would prove to be a useful work of reference for mine managers, engineers and others. Particular attention is paid to the problem of safe shot firing in coal mines.

Chapter I. takes up electric fuses and detonators, exploders, wire and cables, and test; Chapter II., explosives and explosive risks; Chapter III., a most invaluable chapter, deals with practical applications, and Chapter IV. with the laws and regulations relating to the storage and use of explosives. An appendix gives a list of permitted explosives. The illustrations are numerous and well chosen.

EXCHANGES

In *The Mining World* of July 13th Ralph Stokes writes of "Mount Bischoff Tin Mine, Tasmania." The "Mount Bischoff's" monthly average production of block tin has fallen from 229 tons in 1885 to 60 tons in December, 1906.

The Colliery Guardian, July 5th, reprints a paper on the "Polmaise Collieries," recently read before the Mining Institute of Scotland. The safety lamps used in these collieries are magnetically locked and electrically ignited.

The Mining World, July 6th, celebrates the beginning of its twenty-seventh volume by reducing its size to the

standard 9 inch x 12 inch page. There is, however, no reduction in the amount of reading matter. In this number Mr. R. S. Moss writes of the "Manufacture of Coke from Western Coal." He describes an improved coke oven. "Examining a Placer Property" is also very well worth reading.

The Chemical Engineer, June, contains a paper by Alfred Sang on "Protecting Iron and Stetel from Corrosion." Of metal coatings the writer says: "If the metallic coating is considered merely as a garment which protects the iron article from atmospheric influences, the points which must receive special consideration are the closeness of the fit and the impenetrable qualities of the coating."

The Iron and Coal Trades Review, July 5th, has a description of Eskbank Ironworks at Lithgow, New South Wales. A new blast furnace was recently erected there under the superintendence of Mr. Pennymore. It has a capacity of 500 tons per week. It is somewhat surprising to notice from the protograph of this furnace that in general lines, and in equipment, such as vertical elevator, stores, etc., modern designs have not been closely followed. In fact, from its appearance, the furnace might have been designed ten or fifteen years ago.

The Engineering Magazine for July presents some articles of particular value. The concluding number of a series of papers on "Hydro-Electric Power Versus Steam for Industrial Plants, by H. Von Schon, closes with this paragraph: "Generally speaking, an investment of from $160 to $180 per horse-power delivered will show a net earning capacity of 6 to 8 per cent. These are rather high cost figures. The large majority of hydro-lectric developments range between $125 and $150 per horse-power and are therefore capable of a commensurate increase in net returns. The value of these investments is, however, more likely to increase than otherwise, since every indication points to a rise in the price of power service in all branches of industry."

The Engineering and Mining Journal, July 13th, editorially discusses the action of the Indiana Legisalture in prohibiting coal miners from using drills exceeding 2 1-2 inches in diameter, when drilling a hole in coal for blasting purposes. It is claimed that the law limiting the quantity of powder used to six pounds is a sufficient safeguard against blown-out shots. *The Engineering and Mining Journal* points out that, when State Legislatures begin to investigate the quality of powder used, instead of so carefully regulating the quantity, the number of fatalities resulting from blown-out shots will be reduced. It recomends the preparation of a table of permitted explosives.

A correspondent in *The South African Mines, Commerce and Industries* for June 15th writes thus of overcapitalization: "It is obvious that in mining finance, more than in any other branch of finance, the difficulties of 'proper capitalization' are considerable, since it is dependent on the exact estimation of profits which by the very nature of underground operations is difficult to attain. If those who are prone to explain so much by 'over-capitalization' looked with any sense of fairness at the present prices of Rand securities, they would see that, despite the depression, there are more instances of shares standing at over par than below."

The Mining Journal, June 29th, concludes an editorial on "The Rand Strike and the Outlook" with these words: "The nearer future of the Rand, it seems to us, must depend very much on what the Government is able to do for the industry, and therefore their mutual cooperation is greatly to be hoped for, since the present policy of constant hostility by the mining interest can only result in making the Government incline more and more towards the Socialistic labor party, which is arising in South Africa, as it has already done in all our other colonies."

PERSONAL AND GENERAL

Mr. J. B. Tyrrell is examining properties in the Montreal River district.

Mr. Cyril Knight, of the Ontario Geological Survey, is in Tilbury, Ont.

Dr. Eugene Haanel, Director of Mines for the Dominion, is absent from his office on a vacation.

Mr. Anthony McGill has been appointed Chief Analyst for the Dominion, in succession to the late Dr. Thomas Macfarlane.

We regret to record the death which occurred recently in Toronto of the father of Mr. J. E. McAllister, the manager of the British Columbia Copper Company.

Dr. K. Leith of the University of Wisconsin, was in Toronto on the 14th July. Dr. Leith is exploring the newly discovered extension of the Misabi River range.

Mr. N. Angrignon, a well-known miner, has been appointed foreman of the British Columbia Copper Company's "B.C." mine, in Summit camp, Boundary district.

Mr. Frederic Keffer, engineer of the British Columbia Copper Company, and president of the Canadian Mining Institute, is spending a vacation in Vancouver and Victoria.

Messrs. George Caverhill, of Montreal, and Mr. W. G. Ross, managing director of the Montreal Street Railway Company, have been appointed directors of the Dominion Iron & Steel Company, to fill vacancies on the board.

Mr. H. E. T. Haultain, general manager of the Canada Corundum Company, Craigmont, Ont., passed through Toronto on his way from New York. Mr. Haultain has been looking into the manufacture of abrasives in the United States.

"Joe" Taylor, a pioneer prospector in the Boundary district, where he located the Dominion Copper Company's "Brooklyn" and other important mines, died at the General Hospital at Phoenix on June 31st, at the age of 66. He was a genial and kindly soul and enjoyed a deserved popularity.

Mine wages in British Columbia are advancing in all districts, and following the example set by mine managers in Rossland and Boundary, the Yale Mining Company, operating at Hedley, in the Similkameen, has increased the scale from $3 to $4 a day, and reduced the hours of work to eight.

It has several times been claimed that platinum has been found in place in the Tulameen, Yale district, B.C., but it is only recently that capital has shown any disposition to investigate these claims, a group of properties on Champion Creek having been bonded this month to Colorado investors for $80,000.

The task of reporting on the iron ore resources of Vancouver Island and other areas on the Pacific seaboard in which the mineral occurs, for the Federal Department of Mines, has been entrusted to Mr. J. Lindeman, whose report will be published in a monograph on the subject of the Dominion's iron resources to be issued by the Department.

ordinary bituminous coal to lignites. From the Pacific coast to Behring Sea and the Arctic Slope, through the valleys of Copper and Yukon Rivers and their tributaries, coal beds are widely distributed. The work of

the present season will include studies of the coal-bearing rocks of the southeastern part of the territory and of the Yukon coal fields so far as they are accessible from the Yukon River.

Mr. C. D. Rand, a well-known broker, has been elected president, and Mr. J. Kendall, F.C.A., secretary of the Vancouver Stock Exchange, to which the British Columbian Legislature granted a charter at its last session.

Mr. Fritz Cirkel visited Toronto on July 17th. Mr. Cirkel, with two assistant engineers, is gathering information concerning all the producing mines, metallurgical establishments and the mineral industries in general of all Ontario. The hand-book, in which all these facts will appear, in conjunction with similar information from every Province of the Dominion, will be published by the Federal Mines Department early in 1908.

Mr. Herbert Carmichael, Provincial Assayer of British Columbia, has been delegated by the authorities to make a reconnaissance survey and make a complete report on the resources of the country tributary to Alberni, on the east coast of Vancouver Island. At one period this district boasted more than one producing mine and the surface prospects appeared quite promising. The present work will include the surveying of Great Central Lake, and it is proposed to establish stations from which triangulations will be made.

Bulletin No. 314, published by the United States Geological Survey, is of special interest to Canadians, in that it treats of the coal areas of Alaska, and consequently has considerable application to the Yukon. This report states that of the 600,000 square miles forming the territory of Alaska, it is estimated that 12,644 square miles are underlain by rocks that probably contain coal seams, and that 1,238 square miles contain workable coal, ranging in age from Carboniferous to Tertiary, and in composition from anthracite of good quality through high grade semi-bituminous steam and coking coals and

An exceedingly interesting report has been issued by the British Home Office under the title of "Colonial and Foreign Mineral Statistics." This report shows that in 1900 the number of persons engaged in mining and quarrying in the world exceeded five millions, of which approximately one-third were employed in the British Empire. As however these statistics do not include the labor employed in the metal mines and quarries of the United States and some other lesser important countries, they are not conclusive. More than half of the labor mentioned was employed in coal mining, Great Britain employing over 843,000 persons alone, the United States 626,000, Germany 548,000, and France 175,000. The coal produced during this period amounted to 941,000,000 tons, the value of which is estimated at over $1,500,000,000. In point of relative importance, it is interesting to note that Canada takes second place, following closely on India, among the coal-producing possessions of the Empire, though our output of, in round figures 8,000,000 tons, appears small in comparison with the enormous production of the Mother Country of 239,918,239 metric tons. Of the world's gold output the Empire contributed 59 per cent.; Australia contributing 19 1-2 per cent., the Transvaal 26 1-3 per cent., and Canada 3 3-4 per cent. The total value of the world's output of minerals is roughly estimated as representing about $3,500,000,000. The death rate from accidents in coal mines in this year was 2.72 per 1,000 in British Columbia and 1.86 in Nova Scotia, as compared with 1.35 in the United Kingdom and 3.45 in the United States.

Mr. W. H. Cowell, formerly associated with the Algoma Steel Company, Sault Ste. Marie, has been appointed secretary-treasurer of the Wellman-Seaver-Morgan Company, of Cleveland, Ohio.

Mr. John MacDonald, who until recently has been on the engineering staff of the Trethewey mine at Cobalt, has been appointed manager of the Foster in this camp.

Mr. J. Argall, manager of the Iron Mask mine at Kamloops, B.C., now being successfully operated by an English company, has returned to British Columbia from a visit to the Motherland.

It is to be noted that another important discovery of mica is reported to have been made some forty miles north of Buckingham, Que., and development operations have been already commenced.

Mr. Alexander Henderson, of Vancouver, a former County Court Judge for the Province of British Columbia, has been appointed Governor of the Yukon Territory, in succession to the Hon. W. W. B. McInnes.

The Council of the Society of Arts (London) are offering a gold medal or a prize of £20 for the best portable apparatus or appliance for enabling men to undertake rescue work in mines or other places where the air is noxious.

The United States Consul at Victoria, in an official report to his Government, states that the British Columbia output of copper has increased 800 per cent. in ten years, while that of the rest of Canada has increased 50 per cent. in this period. To the successful mining of copper is attributable largely the improved showing of the Western Province in respect to profit-earning distributions, the dividends paid last year by the mines aggregating in amount, it is said, between three and four million dollars.

In a leading article *The Iron and Coal Trades Review* refers at length to the extraordinary expansion of the steel industry in the United States, as indicated by the largely increased output and more presently by the number of new blast furnaces which have already been built this year or are being completed. Thus since January last no less than nine furnaces have been blown in having a rated annual capacity of 1,260,000 gross tons, while twenty-seven others are in course of construction, the rated capacity of which is roughly four million tons annually.

Mr. D. D. Rosewarne, F.G.S., London, M.I.M.M., M. Am. Inst. of M.E., has arrived from England to spend a few months in the examination of the Cobalt and adjacent districts on behalf of London financiers. Mr. Rosewarne was one of the early pioneers of the Broken Hill district of New South Wales, and, having spent his boyhood days in the Comstock, Nevada, U.S.A., should have an intimate knowledge of silver ore. For some years he was Chief Inspector of Mines for the South Australian Government. He intends making his headquarters at Haileybury.

Mr. L. Pratt, the manager of the Last Chance mine at Sandon, B.C., in an interview published in a Nelson paper, speaks very favorably of the conditions now existing in the silver-lead sections of West Kootenay, due of course in a measure to the present high prices of the metals. Another erstwhile important mine, the Good-enough, has been reopened, and there is a general activity throughout the district. It is to be noted that under the terms of the Bounty Act, producers of lead ore are no longer entitled to the subsidy, since the price of lead in London is now quoted at over £20.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay, July 15th, 1907.

A regrettable accident occurred at the new No. 4 winning of the Nova Scotia Steel & Coal Company on the 6th of July, by which three men were fatally injured. Two tubs, one filled with coal and the other with water, ran back down from the bankhead and collided with these men at the face of the deep. The evidence given at the inquest appears to prove that the accident was due to the neglect of the chain runner to turn a switch after the rope was knocked off at the brow of the slope. There was laxity, but not such laxity as would warrant the headlines and the attitude of *The Halifax Herald* in its issue of the succeeding day. Under the usual red headlines the *Herald* writer makes some very naive comments on "the mine running without 'Sampsons'" and other matters, and we rather suspect the writer had a very vague idea of what a "Sampson" is. To quote: "Attorney-General Pipes will not be held guiltless if he allows anyone to escape, whether it be officials in the management of the mine, or chain runner, or whoever else may be responsible. It will be no use for Hon. Mr. Pipes to say that he is leaving the enforcement of the law to the Cape Breton police. He should act, and act at once, and order the arrest of whoever is responsible, or of all who are responsible."

We do not think such language is called for by the circumstances of the case, sad as they are. The officials of the Nova Scotia Steel & Coal Company are not going to abscond, nor do the mining community of Cape Breton need the assistance of *The Halifax Herold* in what is distinctly their own business.

Since the date of the above remarks it has been plainly brought out in the coroner's inquest that the accident was the direct result of disobedience of orders, and there is no doubt that proper cognizance will be taken of this. But no thanks will be due to *The Halifax Herald,* whose irritating proclivity to offer advice on matters with which it is imperfectly acquainted is becoming so proverbial that any efficacy its remarks once possessed has now disappeared.

Glace Bay, C.B., July 12th, 1907.

After a great many delays the petition for a plebiscite on the question of the retention or the non-retention of the so-called "Scott Act" has been allowed by the powers at Ottawa, and it is understood that the plebiscite will now be taken. There is, therefore, a possibility that the Scott Act may be repealed in Cape Breton County, and that the Provincial Licensing Law may take its place.

The liquor problem has a very decided bearing on the mining industry of this Island, and almost anything would be better than the present farcical state of affairs now prevailing here. Reference has been made on a previous occasion in these columns to the loss of output occasioned fortnightly by the "pay-day drunk," and it is a moot question whether the Scott Act, or rather the way in which this Act has been maladministered, is not to blame for most of this lost time and disorganization of all colliery business.

The Scott Act makes the sale of drink illegal, and provides all sorts of penalties for the offender. Somehow, notwithstanding, the drink is sold, and in large quantities, but as the traffic is theoretically illegal no supervision of the quality of the liquor dispensed is possible. Consequently our miners get their "pizen" of a peculiarly deadly and ghastly blend, stuff that maddens and paralyzes at very short notice.

Further, the various abortive and spasmodic attempts that are made to enforce the law make it necessary to maintain the semblance of secrecy. Secrecy always makes a bad thing worse, and it does not need a labored argument to prove that slinking round a corner in a surreptitious manner to get a drink is not calculated to increase the self-respect of any man. Once he gets into a bar he finds it is advisable to take a bottle of "square face" home with him because of the difficulty of getting another drink. The consequences are inevitable, and are also very apparent when Monday's colliery outputs come to be reckoned up. Everybody in Cape Breton knows how thickly the country roads, parks, and every cemetery and back lot is strewn with whiskey flasks in various stages of brokenness. These things are everywhere, and they tell their own unmistakeable tale. The motormen on the electric railways know the effects of a "pay-day jag," and many a poor fellow has met his death under the cars when laid across the rails, which in this country seem to exercise a peculiar fascination for the man who is drunk on Scott Act "firewater."

The experience of the Colorado Fuel & Iron Company in this matter of the "pay-day drunk" is well presented in a thoughtful article by Lawrence Lewis that appeared in *The Engineering and Mining Journal* for the 29th June last. Of course, social conditions in the mining camps of Colorado and in the coal fields of Cape Breton are not by any means the same, but nevertheless the social problems of mining districts are the same the world over, and only vary in their intensity. In the experience of the company referred to prohibition proved an utter and total failure, and culminated in a glorious orgy on the 4th of July, 1901, which laid their mines off for five days. Prohibition has always proved a failure, and will always prove abortive in any community where even a small minority of public opinon countenances the use of liquors. The Colorado Company instituted a "restricted club" with bar room, billiard room and pool rooms, card and game rooms, where limited stakes were allowed, and a well-provided reading room. This restricted club is said to have changed the Town of Coal Basin from a "prohibition to a temperance town." Into this sentence is packed a wealth of ironical and practical wisdom.

There is no disguising the deadly monotony of life among the miners in the average coal mining colony, more particularly among the newcomers and foreigners. Take the position of German, Belgium and English miners who come to Cape Breton from the mining towns of the Old World. They have from childhood been in the habit of imbibing light wines and beers, and have all their lives had places of amusement to visit. The German has his "bierhalle" and "theatre," the Frenchman his "cafe chantant," and the Englishman his "pub" and colliery reading room. Everyone of them in all likelihood has had his little garden allotment also. Then they find themselves in Cape Breton, where to drink is a legal crime, and where a man must cover his tracks if he wants a pint of beer, as if he were some nocturnal marauder. When he gets his drink he is oftentimes ignorant of its vicious nature, and he is in the hands of the policeman or has unknowingly committed some assult before he really knows what he has done.

The farce of Scott Act administration is, further, a moral canker that is steadily undermining the respect for law that should be inherent in the breast of every subject of the King. It opens a door for every kind of "graft" and political jugglery. In a word, the present condition of the liquor traffic in Cape Breton is a standing menace to the industrial prosperity of our coal fields. A most significant factor in the present agitation is that the liquor dealers themselves wish to see the Scott Act retained. The rum-seller is not usually a philanthropist either.

There can be no doubt in the opinion of a great many thinking people in Cape Breton that a properly framed licensing act, with restricted hours, Sunday closing, and honest police supervision, will more efficiently control a traffic which, while not the most beneficial in the world, yet exists in response to a public demand, and it will further put the publican on the same footing as the grocer who sands his sugar or sells margarine for butter. The

man who wants his glass of beer should be able to get one in an open manner, and not have to skulk in holes and corners for fusel oil and dilute brimstone.

While the present Scott Act remains in "force" the hands of the coal operators are tied, and they could not if they wished attempt a sociological campaign for the amelioration of the present unsatisfactory conditions, and any attempt to run reading rooms or clubs on strictly temperance lines or "Sunday School" methods is foredoomed to failure.

ONTARIO.

Cobalt.—Your correspondent has been so much occupied with strikes and rumors of strikes that the gathering of news has been neglected. The Western Federation has succeeded, with the help of the managers, in bringing about a deadlock. The policy of the Federation leaders was simply and solely to prove to the men that they, the men, could get anything they asked for. The managers foolishly (as events have proved) gave out their ultimatum at the precise moment when it best served the purposes of the imported professional agitators. The managers could have silenced the men by concessions at an earlier date; or they could have preserved silence—probably the wiser course of the two. If the initiative had been left to the men they could not have manufactured a case. If the leaders of the Federation had not openly boasted of their power to get any terms, a settlement would have been easily reached. As it is, foreign interference has brought about a cessation of work, has injured the reputation of the camp and has embittered the relations of the managers and men. The point is that if the men had been left to themselves they would have got peaceably whatever reasonable concessions justice demanded, without injury to themselves or to the camp. The demagogues of the Federation have rendered calm deliberation impossible, have belittled the Government's represntatives, and have encouraged the spirit of opposition. This is not armchair criticism.

GENERAL MINING NEWS

NOVA SCOTIA.

Sydney, July 12.—It is understood that the transfer of the Gowrie and Blockhouse Collieries and other areas at Port Mouton and vicinity to the Atlantic Coal Company, Limited, has been practically completed, and that operations on a large scale will shortly commence. Nicholas Richardson, of Newcastle-on-Tyne, who represents the interests of the British investors, will, it is stated, undertake the management at the collieries. Mr. Richardson left by to-day's train for Halifax. The people of Port Morien as well as those interested in the new company have every confidence in the future of the town and the operation of this important enterprise.

Sydney.—The Dominion Iron & Steel Company will not be seriously affected by the destruction of the Wabana ore piers. At Sydney fully six months' ore is in stock. It will be quite possible for the company to make up the loss by extra effort.

At the new mine of the Nova Scotia Steel & Coal Company three miners were killed on July 6th, through the carelessness of a chain runner.

ONTARIO.

Sudbury.—Prince Luigi, Duke of the Abruzzi, visited Copper Cliff early in July. The Prince arrived in the private car "Cignet," in which Mr. and Mrs. S. H. P. Pell, of New York were his hosts. The party was entertained while in Copper Cliff by President A. P. Turner.

North Bay.—The Trout Lake smelter, near North Bay, is nearly completed. Already some ore has been treated.

Mr. J. J. Bell, of Toronto, is to take up certain branches of the work connected with gathering information for the Mines Department of Ottawa. The clay industry and certain mining sections of Western Ontario will constitute Mr. Bell's field.

Cobalt.—The Cobalt Right of Way Mining Company on July 16th declared a dividend of 7 per cent., the second within three months at the same rate. Two carloads of ore gave a profit of $61,840 after paying all expenses. So far all mining has been done by hand. But the compressor will be running within a few days.

The following table shows what has been offered and demanded in Cobalt in the way of wages and hours, as compared with the compromise finally rejected by the owners:—

Surface Labor.	Owner's offer, 10-hour day.	Men's demands, 10-hour day.	Compromise rejected by owners, 9-hour day.
Carpenters	$3.25	$3.75	$3.50
Do., helpers	2.50	2.75	2.75
Mechanics	3.75	3.75	3.50
Pipe Fitters	3.00	3.25	3.50
Blacksmiths	3.75	3.75	3.50
Do., helpers	2.50	3.00	2.75
Engineers (hour)	.30	.35	.35
Firemen (hour)	.25	.30	.30
Ore Sorters	2.75	3.00	2.75
Do., helpers	2.50	3.00	2.75
Hammersmen	2.75	3.00	3.00
Teamsters	2.50	2.75	2.75
Hoistmen	2.75	3.00	2.75
Cage or Bucketers	2.25	3.00	2.75
Others on surface	2.25	2.75	2.75

Underground Labor.	Owner's offer, 10-hour day.	Men's demands, 8-hour day.	Compromise rejected by owners, 9-hour day.
Timbermen	$3.25	$3.50	$3.50
Machine men	3.25	3.25	3.50
Do., helpers	2.75	3.00	3.00
Cage or bucketers	2.50	3.00	3.00
Others underground	2.50	3.00	3.00

The miners also asked that not more than 65 (instead of 75) cents per day be charged for board; miners in shafts, 25 cents extra per day. Cooks were to get $80 per month.

The City of Cobalt Mine accepted the nine-hour day and miners' schedule of wages, after its manager had signed the owners' agreement to refuse anything but their own schedule. The Board of Directors of the company took the matter in their own hands and decided to accept the men's terms. Their employes are returning to work. The Nipissing, Coniagas, Trethewey and Cobalt Lake mines are operating with partial staffs. The mine owners are recruiting Italian and other laborers in Montreal. To block this, the miners are circulating notices requesting all sympathizers to refuse employment in Cobalt. In this movement officials of the Western Federation of Miners, residents of the United States, are taking a most active part.

On July 17th Silver Leaf shipped a car of twenty tons, mostly high grade ore. McKinley-Darragh also shipped a care load, 42 tons of good ore.

ALBERTA.

Mr. D. B. Dowling, late of the Geological Survey of Canada, and at present in charge of a prospecting party sent out by German capitalists, has discovered coal not far from the Yellow Head Pass, where the Grand Trunk Pacific and Canadian Northern will probably cross the Mountains.

SASKATCHEWAN.

Regina.—Premier Scott has announced that while steps have been taken to reserve the coal lands discovered northeast of Eagle Lake for the benefit of settlers, nothing had been decided with regard to its development by the Government.

BRITISH COLUMBIA.

About twenty-five men are employed in the Cariboo-McKinney mine.

At Spruce Creek, Atlin, a discovery of large gold nuggets has been reported.

The skip service of Le Roi mine main shaft has been extended down in four compartments to the 1,650 foot level. A new wire rope has been put on the tramway and a new crusher installed.

The dam of the Bear hydraulic mine, Cunningham Pass, broke on June 27th, causing about $3,000 direct damage and putting a stop to all piping for the year. The building for the pilton wheel and dynamo was swept away and 160 feet of pipe line, 108 feet of sluice flumes and about 600 feet of ditch were lost. The stable also was destroyed. The loss of the season' water and the consequent stoppage of hydraulicking is, of course, the most serious loss. The dam was 38 feet high and was constructed of log cribbing, well brushed and heavily banked on the upper side with clay and gravel. The area of the water was about 1,000 feet in width by one and a half miles long. About 100,000,000 cubic feet of water was stowed behind the dam. The break was caused by the filling and embankment washing out.

Nelson, B.C.—A new mill is under construction at the Blue Bell mine, on Kootenay Lake, nearly opposite Ainsworth. The cement foundations are finished and the building is well under way. Ten Wilfley tables are to be installed. These are being built in Nelson by the Nelson Iron Works. It is probably that several tables of the Deister type will also be installed. The Deister is of moderate price and occupies less floor space than does the Wilfley. The mill is designed for the recovery of both lead and zinc. After going through the crushers and trommels, a recovery of lead is made in several sets of jigs. The zinc and iron middlings are then put through ball mills and finally over the concentrating tables, where a last clean separation of lead and zinc is made.

Grand Forks.—The Granby Company has officially announced its intention of largely expanding their whole plant. The new 100,000 gallon steel tank is half finished. When it is finished the foundations for the big steel flue chamber will be commenced. The blower building is to be remodelled. Other enlargements will necessitate more bin room and it is planned to enlarge the storage facilities until a capacity of 15,000 tons of ore and 6,000 tons of coke is reached.

Greenwood.—The labor trouble in the Greenwood mining district is over. Under the new agreement miners get $4 per day, sinkers $4.50 and laborers $3. Labor is very scarce.

The Granby Consolidated are keeping up their shipments to an average of 2,000 tons of ore per day. The British Columbia Copper and Dominion Copper are also pushing development. At the Phoenix mines of the Granby and Dominion Companies very active development is being carried on.

In Lardeau mining division the management of the Eva gold mine are preparing for the erecting of a 100 stamp mill. Twenty stamps are now dropping. The Eva is a dividend-paying mine. On the Silver Cup about sixty tons of ore per month is being shipped. The shaft is down 800 feet. On the Beatrice, a silver-lead property, work has been resumed, and the erection of a tramway is being considered. The Silver Dollar Mine has finished erecting a 40 stamp mill.

The Similkameen Mining & Smelting Company is driving a 500 foot tunnel at its Bear Creek mine in the Similkameen valley. The tunnel will, it is expected, open up a large body of low grade ore and will largely increase the output of the mine.

YUKON.

A. Chester Beatty, one of the chief engineers of the Guggenheim Exploration Company, states that the company now controls ten miles of Bonanza Creek, fifteen miles of tubularies and about eighty million yards of hill gravel claims.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

The output of the Cornish tin mines for the first six months of the present year is valued at £295,594, on a tonnage of 2,504 3-4 tons. The avearge price of metallic tin has been in the neighborhood of £190 per ton, a considerable advance over last year's prevailing prices.

It is interesting to note, meanwhile, that one Cornish mine, the Levant, worked since 1820, has to date accomplished the remarkable achievement of having paid in dividends no less than 50,000 per cent. upon its original subscribed capital.

The establishment in Cornwall of a central school of mining and metallurgy is now receiving the consideration of the Board of Education.

FRANCE.

A bill has been passed by the Chamber of Deputies constituting eight hours a maximum day's work in mines. The bill was adopted on a vote of 427 to 123.

UNITED STATES.

Except for a shortage of miners in Colorado, which still continues to occupy the premier position among the gold-producing States of the Union, conditions are eminently satisfactory, and more activity is being displayed than at any previous period. This includes not only the development of new mines, but the reopening of old abandoned properties, which now, however, thanks to the appreciation in the values of metals and improvement in mining and metallurgical methods, may be worked at a profit. The immense water power to be derived from the mountain streams of Colorado is, moreover, being turned to account and important electrical power plants are being installed with a view to supplying energy to the mines and replace steam.

The report of Mr. Argall, the manager of Stratton's Independence, was presented at a recent meeting of shareholders in London. The report stated that there were 600,000 tons of ore on the dump, averaging in value $3.60. It was expected to save 70 per cent., or $2.52 per ton, of these values at a cost of $1.52. When Mr. Argall's plan for treating the low grade ore left in the mine is put into practice, profits from this and other sources are expected to realize between £40,000 and £50,000 per annum.

For the first six months of 1907 the Utah mines distributed profits aggregating over three million dollars.

Many important new discoveries are reported to have been made this year of iron ore on the Mesabi range. It is also expected that production from the area will show a further increase this year.

AUSTRALIA.

At the opening of the Parliament of West Australia, the Governor in his speech from the throne took occasion to refer to the prosperous condition of the mining industry of the country which, he showed, had already produced gold, copper and tin to the value of £76,000,000, while nearly £16,500,000 in dividends had been paid by the mines.

In the Orange district of New South Wales a number of mines worked for copper some thirty-five years ago and then abandoned are about to be reopened. Two of these properties are already in successful operation.

Some fine diamonds have been taken recently from the Yowah field in Queensland, near the New South Wales border.

WEST AFRICA.

The official report on mining in the Gold Coast and Ashanti for the year 1906 has been issued, and shows a gold production of 210,111 ounces, as against 153,959 in 1905.

SOUTH AFRICA.

The Johannesburg correspondent of *The Mining Journal* (London) anticipates a considerable reduction of costs on the Rand during the next two years, and, he states, the strike of the white miners will assist towards that end. The strike is meanwhile still in progress and there have been several demonstrations.

An association of coal owners has been formed in the Transvaal with the object of putting a stop to the cutting of prices. The whole of the output will be dealt with by the association, the prices being fixed in the respective districts by the calorific value of the coals.

According to statistics compiled by Mr. Ross E. Browne, the general average costs of operating mines on the Witwatersrand is as follows: Developing, 1.659 shillings per ton; mining, 11.980 shillings; milling, 3.084 shillings; cyaniding, 2.904 shillings; total, 19.627 shillings; average number of comparison tons per month, 16,961.

New Companies

Empire Cobalt Mines, Limited, $3,000,000, Cobalt.

Cobalt Silver Bell Mines, Limited, $8,000,000.

The Cobalt-James Mines Company, Limited, $250,000, Toronto.

COMPANY NOTES

At the eighth annual meeting of the North Star Mining Company, Limited, held in Montreal on June 26th, a net profit of $27,000 was reported on the year's operations. The company's mines are situated near Cranbrook, B.C.

One hundred thousand shares of Cobalt-Foster treasury stock will be issued at 75 cents per share of one dollar par value. The allotments will be made on the basis of one share of new stock for nine of old, to shareholders of record of July 10th.

A writ has been entered against the firm of H. Harlan & Company and A. B. Harlan, of Toronto, by J. T. Eastwood. A court order is asked, to compel the defendants to account for all profits in connection with the Leith-Nipissing Silver Cobalt Mining shares.

The O'Brien Silver Mine of Cobalt paid the Provincial Government the sum of $116,000,546.31 on July 16th. This is the royalty due the Government for the quarter ending July 1st, 1907. The Government receives twenty-five per cent. of the total output of the mine at the pit's month.

STATISTICS AND RETURNS

The output of the Crow's Nest collieries for the week ending July 12th was 24,015 tons; daily average, 4,002 tons.

DOMINION COAL COMPANY.

Output, 1st to 15th July, 1907:—	Tons.
No. 1	20,230
No. 2	24,270
No. 3	15,240
No. 4	24,420
No. 5	19,030
No. 6	6,490
No. 8	10,810
No. 9	14,730
No. 10	4,250
	135,470

Ore shipments from the Cobalt camp for June, 1907:—

Mine.	Tons of 2,000 lbs.
Buffalo	143.72
Coniagas	778.10
Colonial	20.00
Drummond	22.04
Foster	20.00
Kerr Lake	47.00
LaRose	211.30
Nipissing	371.82
O'Brien	62.77
Right of Way	64.67
Silver Queen	62.29
Trethewey	110.85
*Temiskaming Cobalt	40.00
Total	1,954.56

Canada—230.18 tons, or 12.24 per cent.

England—40.00 tons, or 2.05 per cent.

United States—1,675.38 tons, or 85,71 per cent.

*Shipped from Haileybury.

Half yearly report of Cobalt camp for 1907:—

Shiping Mine.	Half yearly totals of tons.
Buffalo	539.18
Coniagas	1,431.41
Cobalt Central	77.33
Colonial	40.38
Cobalt Townsite	68.12
Drummond	22.04
Foster	70.18
Green-Meehan	90.39
Kerr Lake	125.10
LaRose	398.79
McKinley-Darragh	30.00
Nipissing	1,404.89
Nova Scotia	15.00
O'Brien	1,175.21
Righ of Way	67.27
Red Rock	20.00
Silver Queen	194.57
Trethewey	620.84
Temiskaming & H. B.	27.95
Temiskaming	27.45
Temiskaming Cobalt	59.91
University	30.69
Total	6,544.70

	Can.	Eng.	U.S.A.	Totals.
January	285.62	.....	703.51	989.13
February	162.69	15.00	703.80	881.49
March	194.72	1.90	830.97	1,027.59
April	160.54	19.91	352.70	533.15
May	194.31	.....	964.47	1,158.78
June	239.18	40.00	1,675.38	1,954.56
	1,237.06	76.81	5,230.83	6,544.70

Canada—1,137.06 tons, or 18.90 pe cent.

England—76.81 tons, or 1.17 per cent.

United States—5,230.83 tons, or 79.93 per cent.

Cobalt ore statement for the week of July 7th to 13th, 1907:—

July 8th, C.P., 4090, Coniagas Mine, American Smelting & Refining Company, Per Amboy, N.J., 62,000; $99.20.

July 8th, C.P. 56748, Coniagas Mine, American Smelting & Refining Company, Perth Amboy, N.J., 62,000; $99.20.

July 8th, C.P. 38742, Coniagas Mine, American Mining & Refining Company, Perth Amboy, N.J., 65,520; $104.82.

July 10th, C.P. 21794, Coniagas Mine, American Smelting & Refining Company, Perth Amboy, N.J., 65,690; $105.10.

July 11th, N.Y.C. 46953, Coniagas Mine, American Mining & Smelting Company, Perth Amboy, N.J., 64,000; $102.40.

July 10th, Soo 21524, Foster Mine, Canadian Copper Company, Copper Cliff, Ont., 52,000; $72.80.

July 11th, G.T. 8284, Buffalo Mine, Charles L. Dennison, New York, N.Y., 60,000; $96.00.

July 11th, L.V. 83038, McKinley-Darragh-Savage, McKinley-Darragh-Savage Manufacturing Company, Newark, N.J., 80,000; $128.00.

Grand Ttotals—511,210; $807.52.

British Columbia.—For the week ending July 6th the following shipments of ore were made in the districts named:—

	Week. Tons.	Year. Tons.
Boundary shipments	36,573	539,685
Rossland	5,988	138,983
Slocan-Kootenay	2,803	64,509
Totals	45,364	743,177

Granby, it is figured, will lose $598,170 as a result of the 3-cent-a-pound reduction in the price of copper. Calumet and Hecla will drop $3,000,000, and Amalgamated Copper no less than $6,000,000.

The following shows what the 3-cent reduction in the selling price means to each concern, as well as the earnings per share on 25-cent copper, and the loss sustained by each share on account of the price reduction.

	Red'n by 3c dec.	Earn per share.	Loss per share.
Cal. and Hecla	$3,000,000	$170.00	$30.00
Tamarac	420,000	25.00	7.00
Quincy	585,000	26.00	5.85
Osceola	557,654	26.00	5.80
Cal. and Arizona	1,124,109	30.00	5.62
Wolverine	290,451	30.00	4.84
Granby	598,170	18.00	4.43
Amalgamated	6,720,000	20.00	4.36
Mohawk	280,567	13.50	2,81
Copper Range	970,589	13.00	2.53
North Butte	985,977	15.00	2.46
Anaconda	2,848,915	12.00	1.85
Utah Cons.	556,019	12.00	1.85
Shannon	358,920	5.00	1.20
Butte Coalition	749,853	4.50	.75
Total	$20,046,224		av. $5.46

New Dividends

The directors of the International Coal & Coke Company have declared a quarterly dividend of 1 1-2 per cent., payable August 1st, to shareholders of record July 15th. This is an increase of 2 per cent. per annum over the former dividend, and means a disbursement of $42,000, or at the rate of $168,000 per annum.

METAL, ORE AND MINERAL MARKET

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—10 to 14 cents per lb.
Arsenic, white—7 1-2 to 7 3-4 cents per lb.
Barytes, crude—$11.25 to $14.50 per short ton.
Bismuth—$1.50 to $1.75 per lb.
Cadium—$1.40 to $1.46 per lb.
Carbons for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chronium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.
Corundum—7 to 9 1-2 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$25 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Mlybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 to 50 cents per lb.
Platinum, ordinary metal—$26 per ounce.
Platinum, scrap—$20 to $21 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump, 10 1-4 to 11 1-2 cents per unit.
Quicksilver—$41 to $42 per 75 lb. flask.
Talc—$18 to $23.50 per ton.
Tungsten, pure metal—$1.25 per lb.
Tunsten ore, 60 per cent. pure—$400 per ton.
Tin—40 1-4 cents per lb.

MARKET NOTES.

Spelter.—Market is dull, despite lower prices. Now York 6.05 cents per lb.; London, £24 per long ton.

Lead.—The London market is weak, otherwise there are no changes of note. New York, 5.25 cents per lb.; London, £20 for Spanish lead.

Tin.—Tine is decidedly weaker. New York, 40 1-4 cents per lb.; London, £183 for spot.

Copper.—Reduction in prices has not encouraged business. The market stands, New York, electrolytic, 20 3-4 to 21 1-4 per lb.; lake, 21 1-2 to 22 cents; London, £94 for spot.

Silver.—July 5th, 67 3-8 cents per ounce; July 6th, 67 3-8 cents per ounce; July 8th, 67 5-8 cents per ounce; July 9th, 67 3-8 cents per ounce; July 10th, 67 1-4 cents per ounce; July 11th, 67 3-8 cents per ounce; July 12th, 67 1-2 cents per ounce; July 13th, 67 3-8 cents per ounce; July 15th, 67 5-8 cents per ounce; July 16th, 67 7-8 cents pe rounce; July 17th, 68 1-8 cents per ounce. Mexican dollars, 52 7-8 cents.

The ore receipts and lead contents in pounds from Hall Mining & Smelting Company's Slocan mines for the first five months of the current year are given below:—

	Ore.	Lead.
January	883,207	299,197
February	2,433,461	883,845
March	4,516,382	2,041,103
April	413,344	182,401
May	2,554,681	1,321,808

A mining deal that will mean a great deal for the development of the mining resources of the district around Port Arthur, Ont., has been closed. R. J. Anderson, of Minneapolis, has purchased from J. W. Andrews his lead property in Dorion Township, consisting of 316 acres. It is said to be very rich in lead. Mr. Anderson has had men at work for a week prospecting. It is the intention of Mr. Anderson and his associates to develop the property on a large scale. Already 20 men are at work mining ore and this number will be increased. Roads are being cut into the property from the railway track, and it is the intention to erect a smelter at the mine as soon as possible.

We have received from Merralls Engineering, Limited, 1123 Broadway, corner 25th street, New York, copies of their several catalogues. Merralls Engineering, Limited, have a factory in Ottawa, Ont. Hence, they are prepared to fill Canadian orders promptly. Their specialties are their stamp mills, described in this column recently, and the "Record" Vanner. Their six stamp mill (double three stamp battery) will handle 40 to 50 tons per day at approximately 20 horse-power. The "Record" Vanner has a new panning or jerk motion and a long, adjustable stroke. It makes a clean separation and a selective delivery of all mineral particles.

WANTED

Mining Graduate (McGill) desires a position in Cobalt or vicinity as Superintendent or Foreman with reliable Mining Company. The applicant has had several years in Montana in the practical work of Mining and Concentrating. At present he is Superintendent of a Mining Company.

Address :—"Montana,"
c/o Canadian Mining Journal.

MINING PROPERTIES WANTED.

Prospectors and others wishing to dispose of Mining Claims or undeveloped Mines in Ontario or Quebec, can communicate full particulars to the address below.

The properties will be examined by competent mining engineers, and if satisfactory, arrangements will be made to buy the same.

Address, General Post Office, Box 481,
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Developed gold, silver or copper, lead. Send maps and reports Will promptly return same if property not suitable.

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Will develop first-class prospect for controlling interest. Would buy under bond and lease. Prefer large, low-grade dedosits. Describe fully. State price and terms. Will promptly return papers.

J. B. SPERRY, 18 BROADWAY, NEW YORK

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Several undeveloped iron claims and several partially developed pyrites claims, within one mile of line of Canadian Northern Railway, 50 miles west of Fort William ; and an undeveloped copper and silver claim near Nipigon, for sale.

Particulars P.O. Box 512, Fort William, Ont.

WANTED AT ONCE.

Young mining graduate with some practical experience to do some work in the province of Ontario. Apply at once to

Fritz Cirkel, M.E., 80 Stanley St., Montreal

MINES AND STOCK FOR SALE

Four Copper Mines assaying high in silver and gold. Nickel Mine running about $68.00 to the ton in silver and situated twelve miles from Sturgeon Falls. Assays and mines can be seen at any time. Also a few thousand shares of Nipissing Copper and Silver Co., Limited. Apply to

R. Niffin, Smoky Falls, Ont.

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Splendid opportunity to secure some good machinery far below the price of new and all or any part of it can be delivered on the cars in one week.

One Class D Rand Cross Compound Condensing Duplex Air Compressor having a capacity of 835 feet of free air and will run 10 No. 2 Rand Drills. High pressure steam 14 x 24, low 22 x 24, air cylinders each 14 x 22. Has Myers' patent steam cut off valves and machanically operated air valves. Machine good as new.

One double cylinder, 10 x 16, Lidgerword Hoisting Engine. Drum, 54-inch diameter and holds about 700 feet of wire rope without overlapping. End friction and friction hand break. This machine is as perfect as the day it left the shop.

Lots of Steam Pipe ranging from 2 to 5 inches.
Light Steel Pit Rails about 14 pounds.
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One Heavy Duty Steam Mining Pump.
One Northy Duplex Steam Boiler Feed Pump.
Rand No. 2 Rock Drills and Barrs.
Rock Drill Steel ready for machines and in good lengths.
One 15 H. P. Steam Engine.
One 25 H. P. Steam Engine.

These engines would be just the ones for a saw mill or could be used as a pumping engine for a mine. Steel Ore Car Bodies just the thing for underground work. This lot of odds and ends will be sold low for cash.

For particulars address, G. M. this paper.

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The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

ENGINEERS, METALLURGISTS AND GEOLOGISTS

Dominion of Canada

Ontario

DeMorest, Stull & Low
Evans & Laidlaw
Fullertan, C. H.
Grover, Geo. A.
Gwillim, J. C.
Handley & McNaughton
Haultain, H. E. T.
Haight, D. H.
Laird & Routley
Hille, F.
Lindeman, Einar
Mattair, L. H.
Roland, W.
Rosewarne, D. D.
Scott, O. N.
Tyrrell, J. B.
Willmott, A. B.
Willis, Alfred B.

Nova Scotia

Jennison & Dahl

Quebec

Cirkle, Fritz
Hersey, Milton L.
Robinson, A. W.
Silver, L. P.

British Columbia

Hagen, Edward A.

Foreign

New York

Hassan, A. A.

ASSAYERS, CHEMISTS AND ORE TESTERS

Dominion of Canada

Ontario

Campbell & Deyell
Evans & Laidlaw
Heys, Thos. & Son
John, D.
Lamble, B. C.
Russell, J. W.
Urquhart, W. J.

Quebec

Hersey, Milton L

Nova Scotia

McCallum, A. L.

Foreign

New York

Ledoux & Co.

BARRISTERS, SOLICITORS, ETC.

Ontario

Cook, Bond & Mitchell
Day, Ferguson & Day
Davis, J. S.
Graham, Harvey D.
Hartman & Smiley
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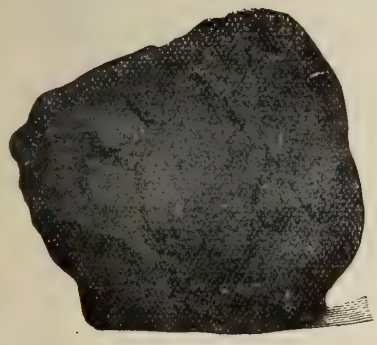
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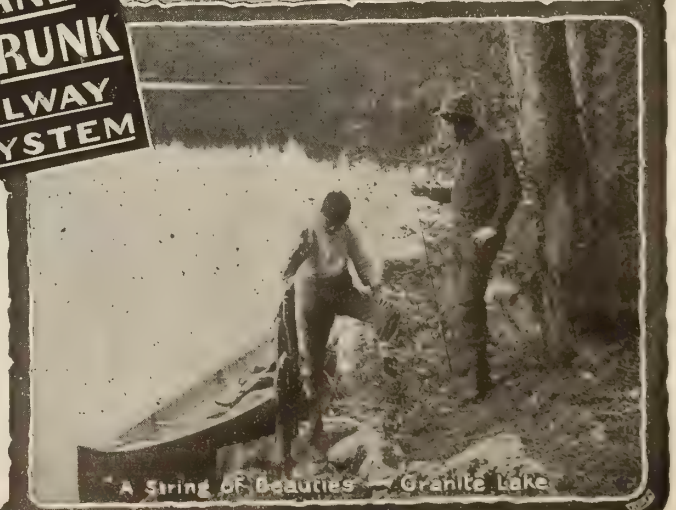
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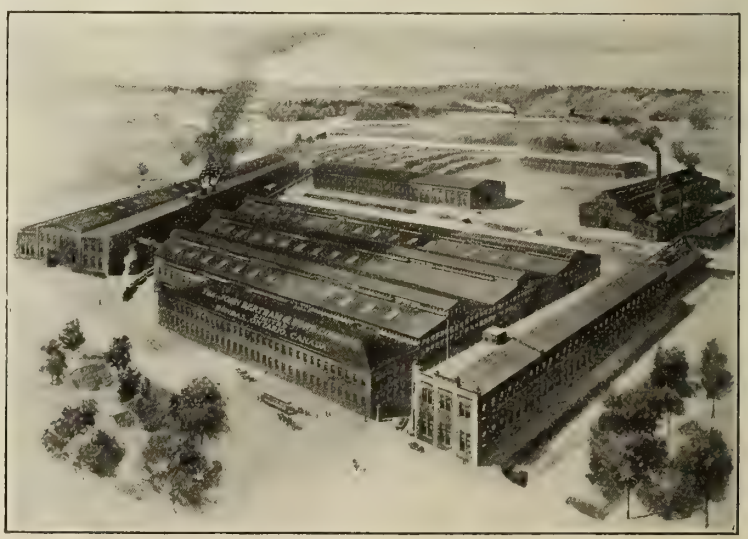
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All mines belong to the Government of the Province on all unsold lands and on all those sold since the 24th July, 1880, but gold and silver are always reserved whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such license the first right to purchase the mines. In the case of lands where the surface only is sold, the owner of the surface may be expropriated if he refuses an amicable settlement

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

On lands situate more than 20 miles from a railway in operation, $10.00 per acre, and on lands situate less than 20 miles from such a railway, $20.00 per acre;

Superficial products and building materials are sold $2 and $4 an acre according to the distance from rail road.

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Patents are obtained subject to the following conditions: The full price must be paid in cash; specimens must be produced and accompanied by an affidavit; a survey at the cost of the applicant must be made on unsurveyed lands; work must be bona fide begun within two years and $500.00 spent for each 100 acre concession.

MINING LICENSES, giving the right to work the mine and dispose of its products, are granted on payment of a fee of $10.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person, and must be marked out on the ground by posts

The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the Government

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the new Transcontinental Railway will run.

The government has made special arrangements with MR. MILTON L. HERSEY, 171 St. James St Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines, at Quebec, will give all the information asked for in connection with the mines of the province, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to:

The Hon. Minister of Colonization, Mines and Fisheries,
Parliament Buildings, Quebec.

The Canadian Miner's Buying Directory.

SEE INDEX TO ADVERTISERS PAGE XXVIII.

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The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

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The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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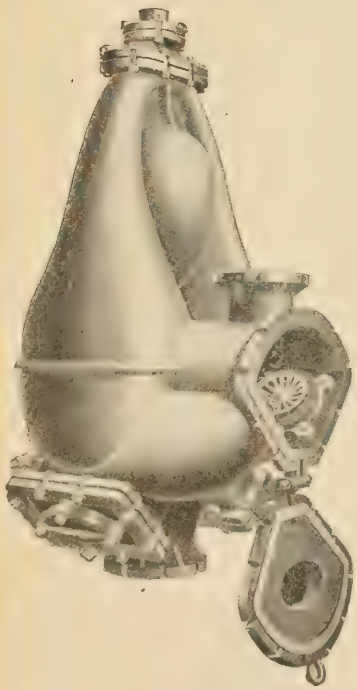
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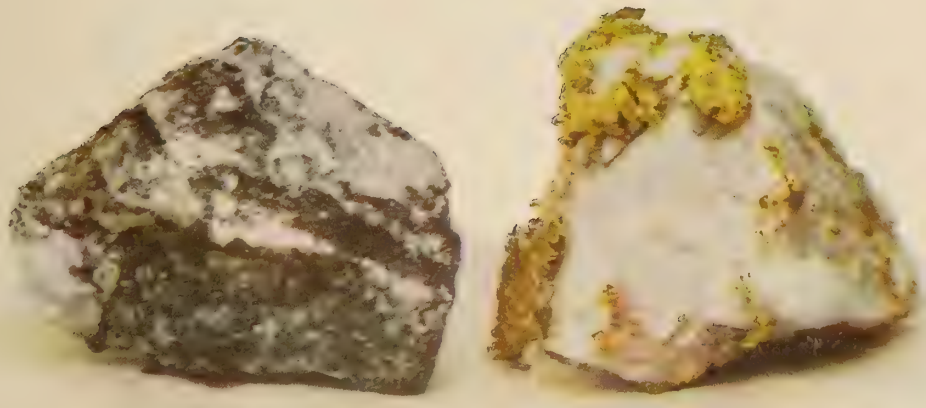
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Gold Ore from Nova Scotia

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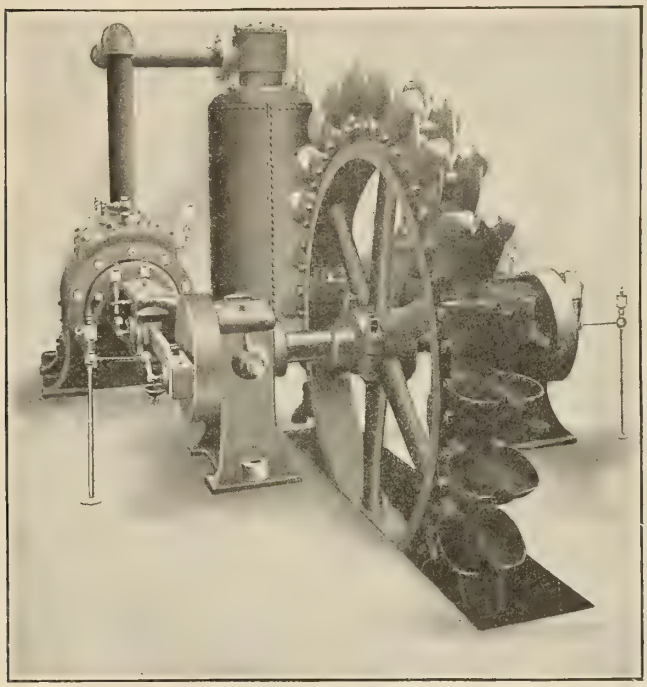
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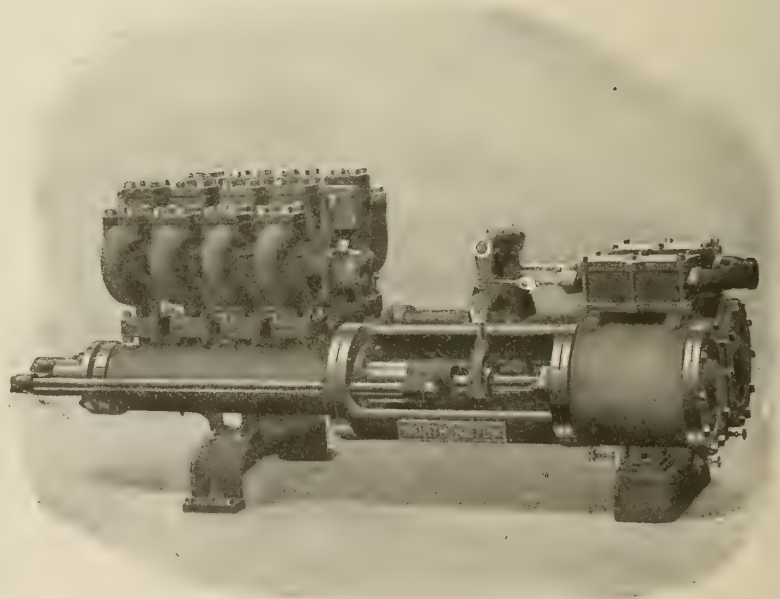
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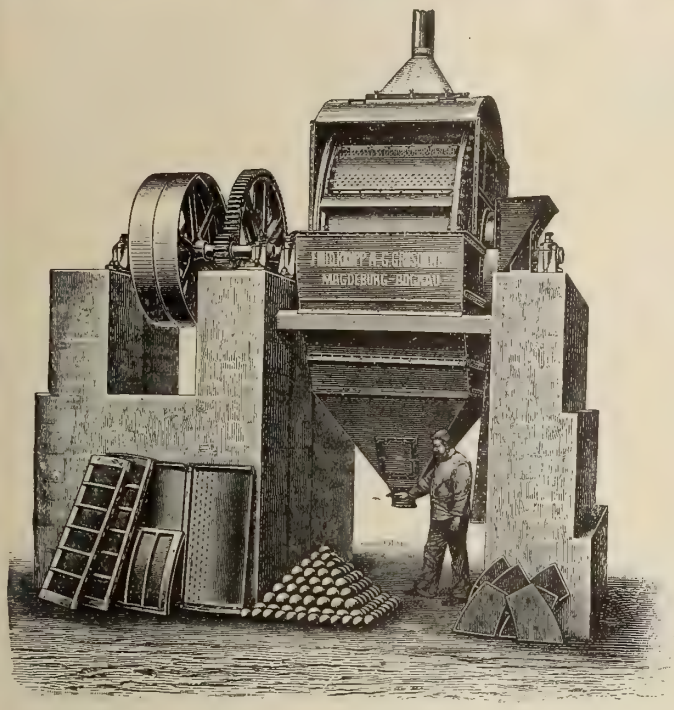
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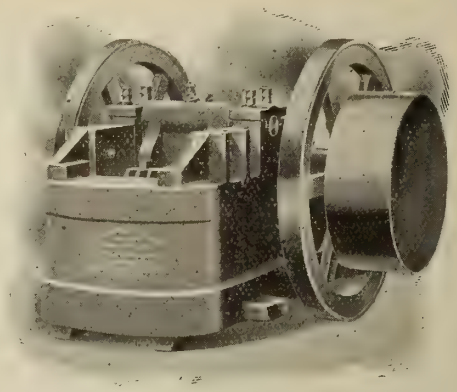
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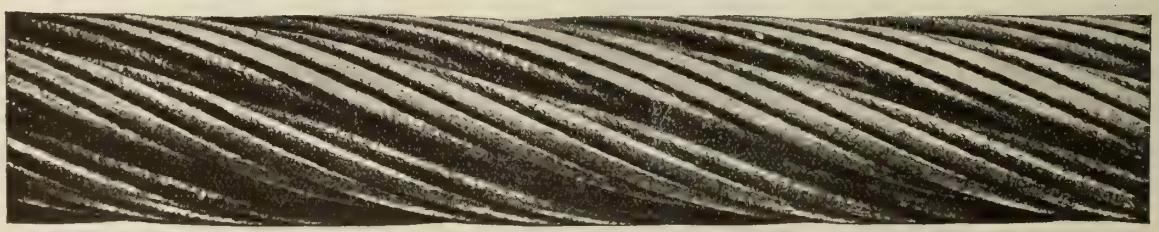


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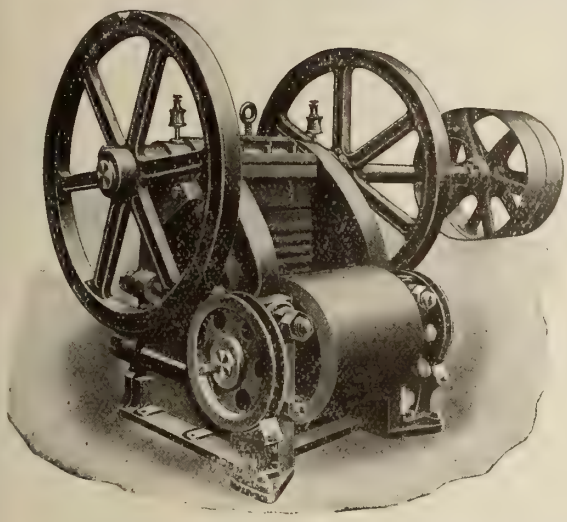
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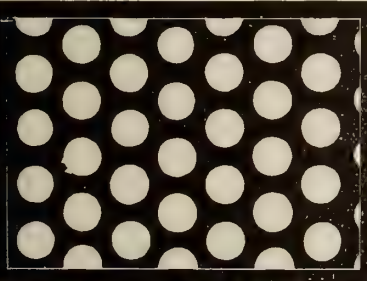
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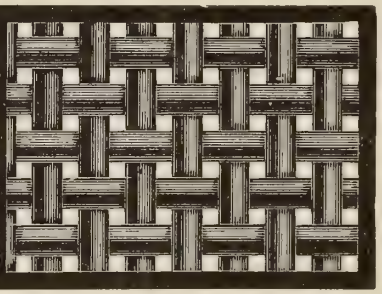
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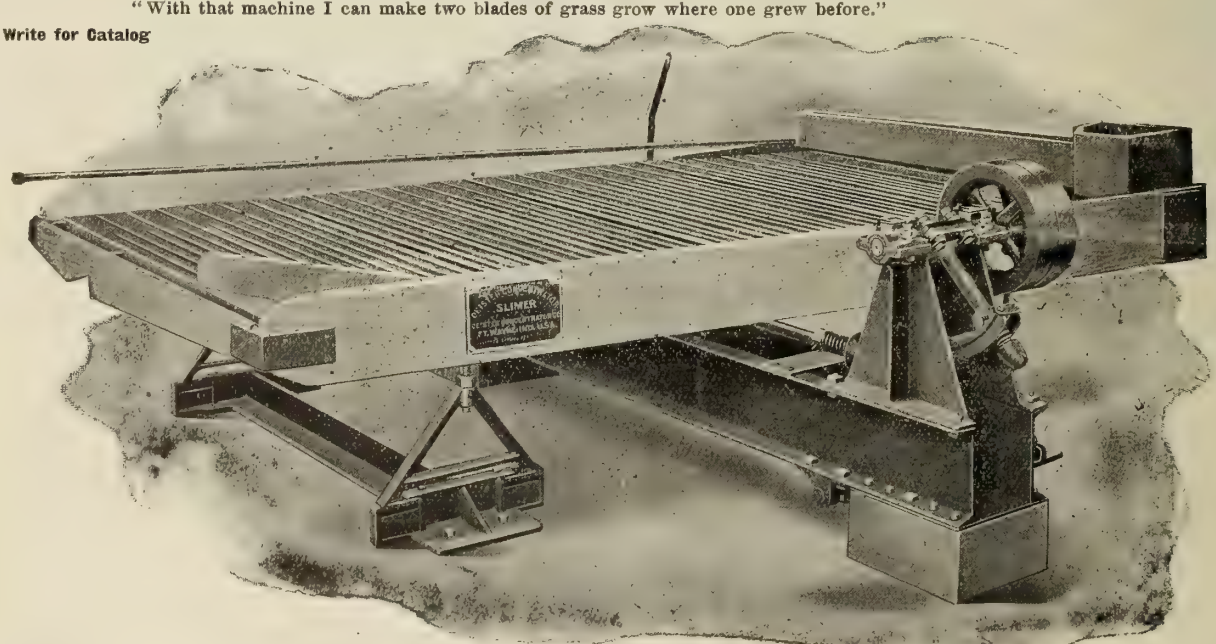
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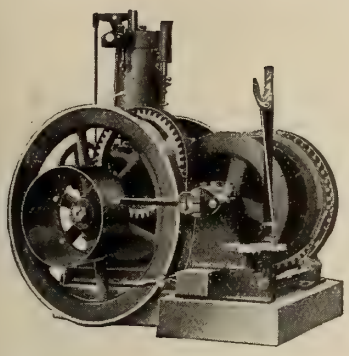
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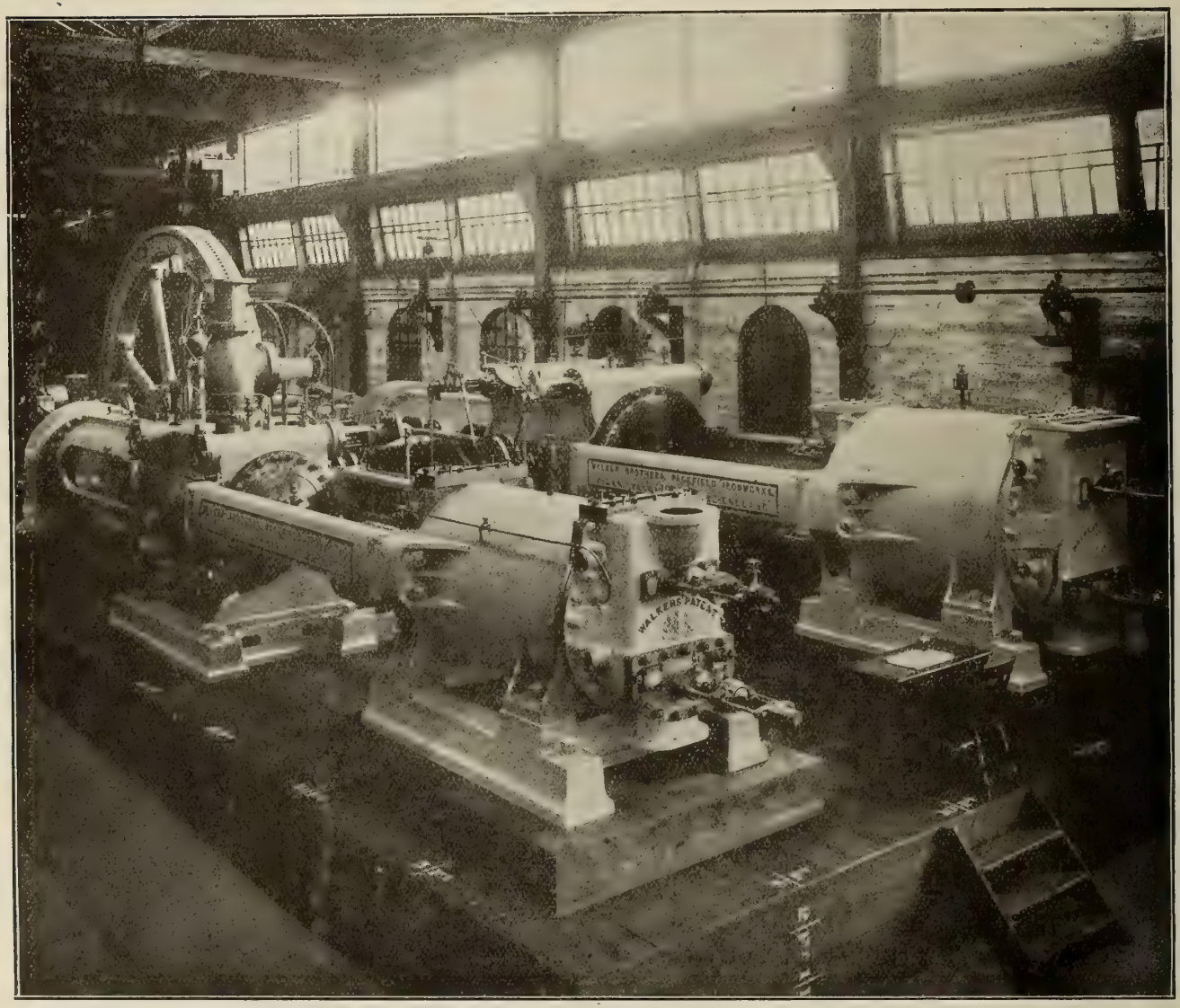
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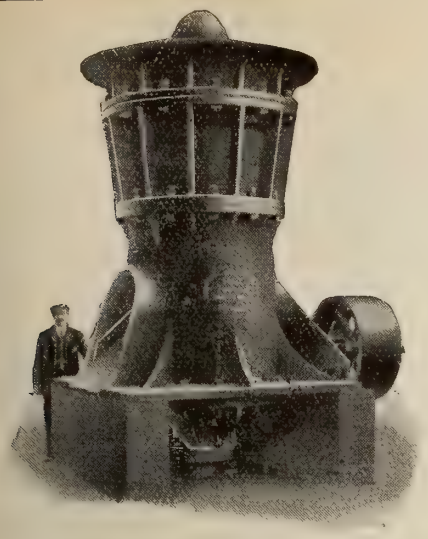
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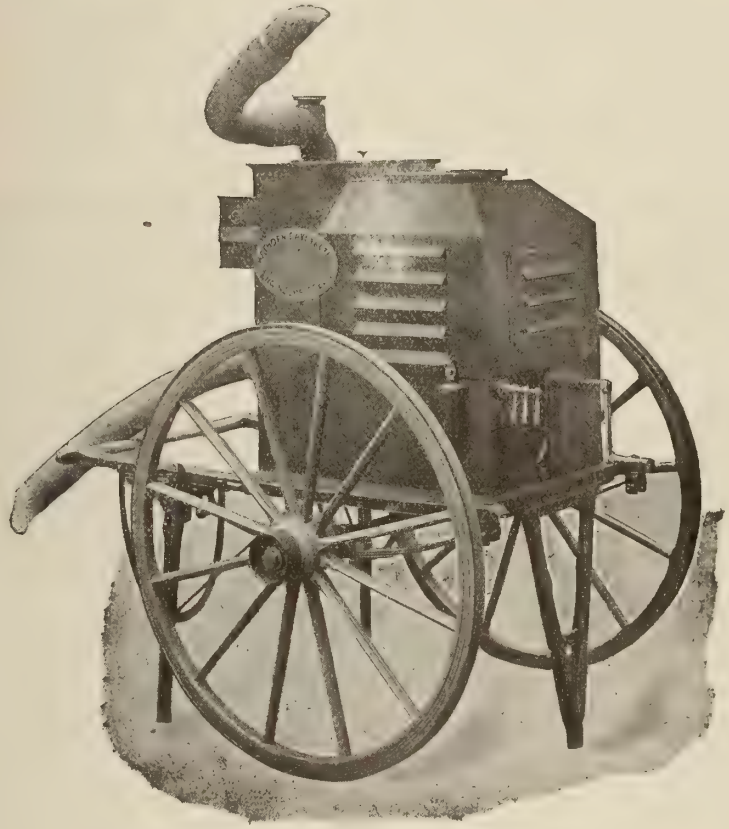
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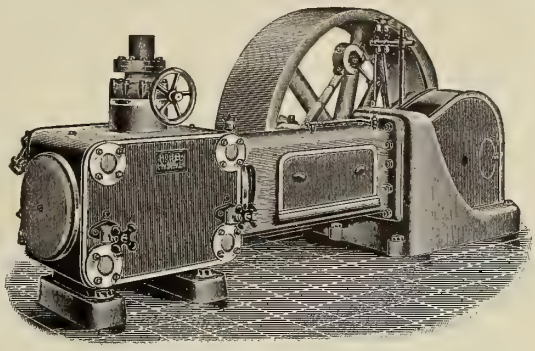
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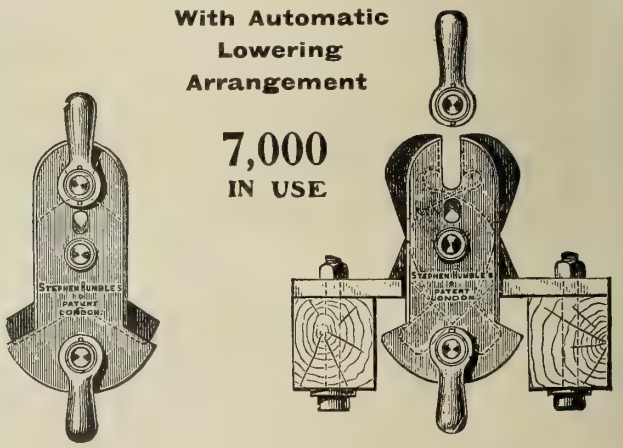
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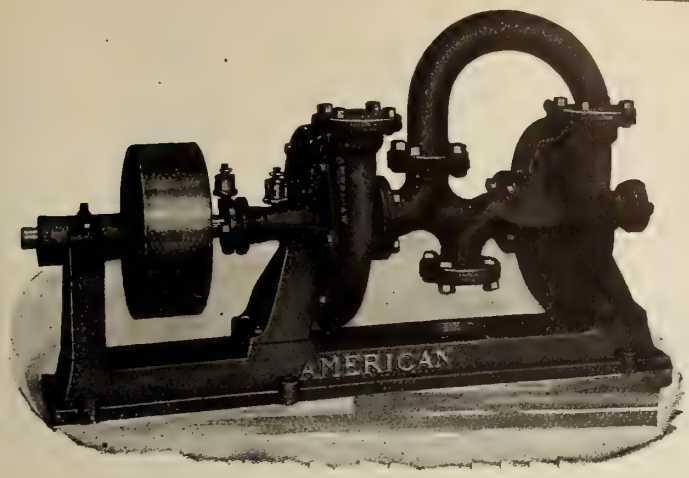
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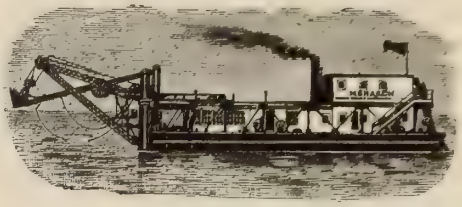
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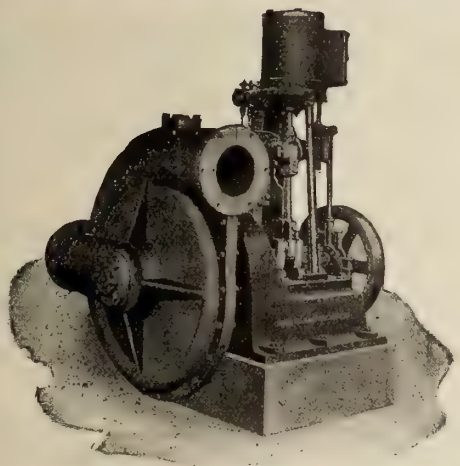
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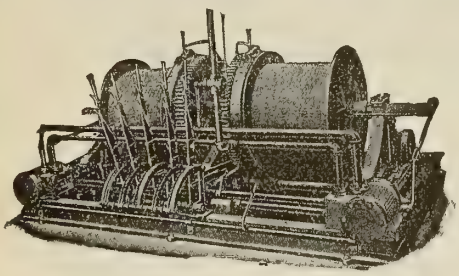
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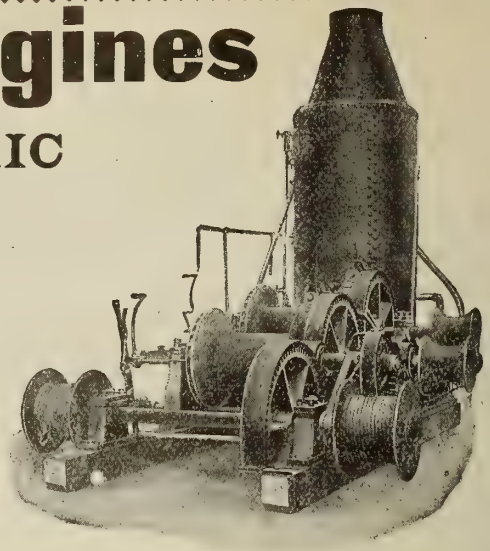
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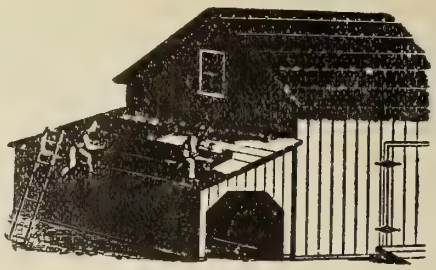
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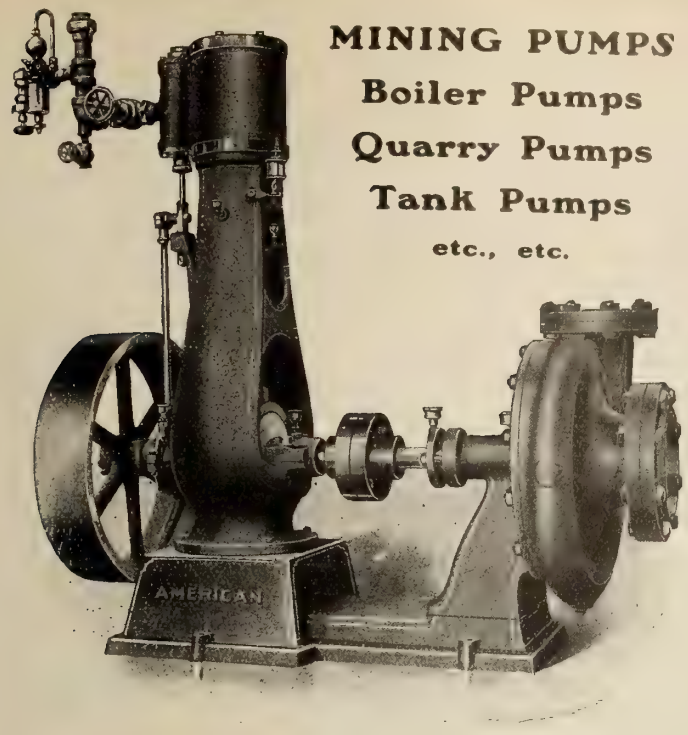
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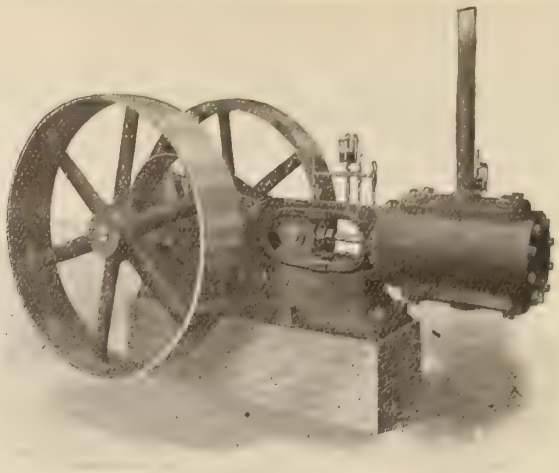
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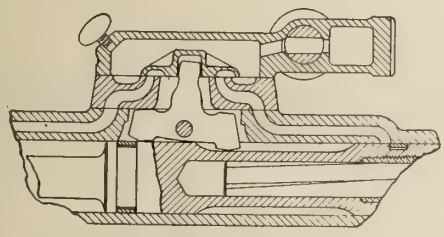


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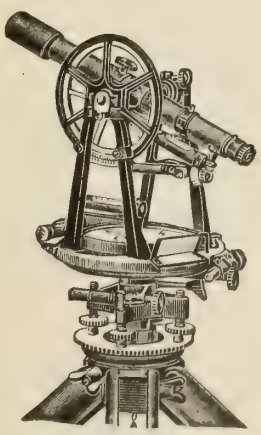
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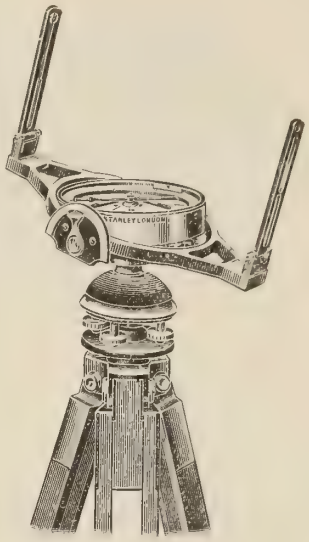
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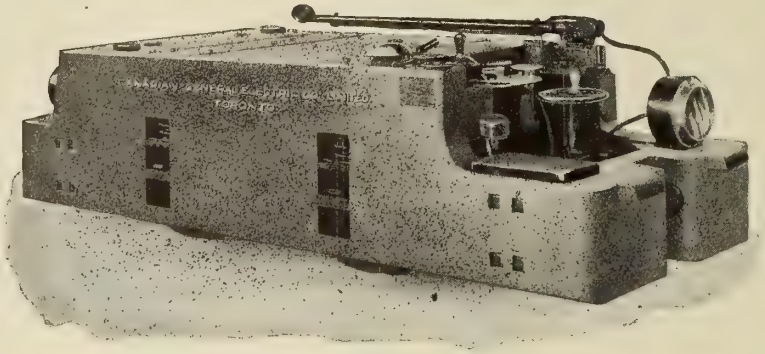
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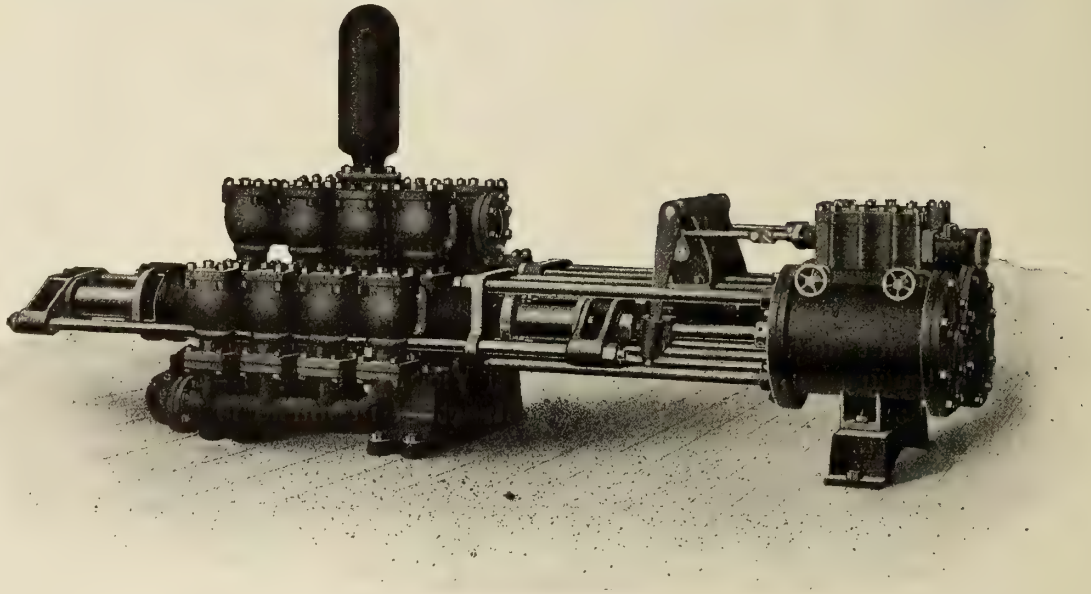
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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M. E., Nelson, B. C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

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THE VISIT OF THE AMERICAN INSTITUTE OF MINING ENGINEERS TO ONTARIO.

The Ontario Provincial Government, animated by a desire to further the mining interests of this Province and wishing, also, to give the representatives of a world-wide institution a more or less definite idea of the richness and variety of Ontario's mineral deposits, invited the American Institute of Mining Engineers to visit Toronto and to make a tour of certain important mining districts. The various towns visited vied with each other in welcoming the visitors. In every respect the visit was a phenomenal success.

THE CANADIAN MINING JOURNAL wishes to congratulate the Local Government upon its wise liberality. Such enlightened acts denote a spirit refreshingly beyond and above the dark realm of party politics. The invitation was extended with the sole objects of rectifying current erroneous ideas and of indirectly advertising the mines and minerals of Ontario. That much good will result need not be doubted for a moment. But too much must not be expected. The visiting engineers are, as a body, keen, observant and hard-headed. They did not gush, nor were they expected to. Each of them, however, will in future have a much fairer conception of what Cobalt signifies. Many of them, who had not visited Copper Cliff before, have now some conception of the magnitude and promise of that nickel-copper industry. In Moose Mountain the visitors will recognize that the hem of what may prove a vast iron ore range has been touched.

Lest any of the recent visitors should carry away the impression that Ontario stands alone in her mining possibilities, it may not be unwise to point to the coal, iron and gold of Nova Scotia, the oil shales and copper of New Brunswick, the asbestos, graphite, mica and chrome ore of Quebec, the coal and oil of Alberta and Saskatchewan, and the unrivalled variety and wealth of British Columbia's minerals. These things we mention because it is not improbable that a special view of one or two sections of Ontario may tend to destroy the perspective when looking at the Dominion generally. This, however, is a digression.

One result of the visit will be that the mining men of Ontario will continue their work with a lessened dread of the evil effects of stock manipulators.

We publish in this issue a letter from Mr. Alexander Gray, formerly editor of *The South African Mines, Commerce and Industries,* of Johannesburg. Mr. Gray is soon to move to Canada.

THE COBALT STRIKE

In justice to the more responsible of the miners at work in Cobalt before the strike was declared, it must be said that the strike was evidently forced upon them. The representative of the Western Federation, carrying with him the prestige of that Union, flushed with a sense of his power and eager to enlighten the ignorant, though happy, victims of the tyrannic mine owners, appeared upon the scene of peace and plenty. Before his lusty educative efforts were put forth, not a single complaint had been heard. On the other hand, the camp was overflowing with well-fed, well-paid miners. Considering the tender age of the mines and the fact that even yet the camp as a whole is not self-supporting, the wages paid were very high. In no other metalliferous mines east of British Columbia are wages as high. The food is, in our own humble opinion, not to be excelled anywhere.

It is not therefore evident, or, at best, it remains to be proved, that the miners had any substantial reason for attempting to tie up the camp.

In discussing any of these clashes between employer and employe, it is difficult to preserve that spirit of impartiality which is so essential to the furthering of peace and progress. The heat of debate, the friction of contending factions and the incidental losses of time and money do not induce a calm and judicial spirit. Yet, in fairness to the workmen, it is well to remember that labor organization have accomplished a vast deal of specific good. On the other hand, certain of these organizations have developed an aptness for abusing their powers. And, lastly, it is high time that Canadian workmen managed their own affairs. They gain nothing by the help of the Western Federation. The very name of that organization stands for methods for which Canadian workmen should be the last to subscribe.

The Cobalt strike has failed because it did not deserve success. The leaders of the Western Federation appear to be surcharged with the desire to precipitate collisions between labor and capital. They did not, in this instance, work up even the color of an adequate excuse. For this they merit condemnation. But, though this attempt failed, there is no reason to doubt that similar attempts will be made in the near future.

It is the duty, not only of Canadian operators, but of Canadian workmen, most especially of Canadian miners, to avoid utterly any measures which bring upon the country loss and discredit. Industrial disputes can and must be settled without the costly strike. It is incumbent upon mine operators to see that good feeling and mutual respect are fostered as between themselves and their employes. Repressive measures are offensive and stupidly ineffective.

Employers and employes generally should prove themselves much more amenable to reason and should observe the letter and spirit of arbitrators' awards with decidedly greater strictness.

ALBERTA MINING CONDITIONS

The report of the Alberta Coal Mines Commission is soon to appear. The points with which the Commission's report will largely deal are the eight-hour day and the question of compensation.

The eight-hour "bank to bank" day is strenuously objected to by a majority of the operators. If the eight-hour day were fixed as the actual time occupied by the miner at his work, the operators would offer no objection. But when the eight-hour day is defined as including the time necessary for the miner to reach his work in the mine and that required to reach the bankhead again, the operator becomes subject to very considerable loss.

This "bank to bank" eight-hour day, more especially in older mines whose workings are extensive, implies a diminution in output which should in justice be met by a reduction in the men's pay.

The report of a similar British Commission, commented upon recently in these columns, demonstrated that a nine or eight-hour day is only nominally such. The actual hours worked in any coal mine are uniformly less than the hours paid for.

MINERS' ANEMIA

Mr. F. W. Gray writes, in this number of THE CANADIAN MINING JOURNAL, on a subject which, in all probability, will be new to most of our readers. Ankylostomiasis, or "miners' anemia," is by no means confined to coal miners. "Broadly speaking, the parasite will be found to occur normally on either side of the Equator, between the fortieth parallels. Within these limits the disease may be endemic and the population may be affected as a whole." Beyond these limits the disease may occur in epidemic form, especially when industrial operations create an artificial environment favorable to the propagation of the parasite. Thus, large brick kilns; hot, moist, unsanitary mines; and deep tunnels may become breeding grounds for these noxious organisms.

Applying the results of European research to Canada, Mr. Gray points out that, while in no sense are our coal mines (especially those of Cape Breton) to be regarded as possessing what is termed a "disposition" to infection, still, on account of the large number of European miners now employed in Canadian coal mines, the possibility of a serious epidemic should be guarded against.

The completeness, the elaborateness and the effectiveness of the campaign carried on by the German provident society, Knappschafts-Verein, under Government supervision, against the spread of ankylostomiasis, arouses unreserved admiration and no small degree of amazement. In striking contrast is the situation in Belgium, where the ignorance and prejudice of the affected classes have been allowed to deter the work of eradication. France, England and the United States have

seriously grappled with the problem of eliminating this loathsome infection. Canada may have to face the problem at any time.

PORT ARTHUR'S NEW INDUSTRY

The blast furnace of the Atikokan Iron Company was blown in about the middle of July. The presence of a modern and well-equipped plant, in so well-situated a locality as Port Arthur, should encourage the exploitation and development of iron ore deposits in all the adjacent districts. A strong iron industry is a pre-requisite of the normal growth of our material prosperity. A successfully operated blast furnace in Port Arthur will give a strong impetus to the opening up and settlement of new territory and will increase most appreciably the importance of the town itself.

NOVA SCOTIAN ENTERPRISE

The economy of generating power at the coal pit mouth and distributing it in the form of electricity to industrial centres has long been evident. It has remained for a comparatively small colliery in Nova Scotia to put the idea into practice. At the collieries of the Maritime Coal, Railway & Power Company, situated in Chignecto, N.S., a large installation has recently been completed and put in operation. The progressive town of Amherst will be the principal consumer of the power generated at the collieries. The men who conceived and made actual this enterprise are deserving of sincerest praise.

EDITORIAL NOTES

The iron ore deposits of Ontario have been the objects of sporadic attention in the past. Fitful attempts have been made to exploit them. At Sault Ste. Marie, at Midland, at Hamilton and at Deseronto pig iron and steel have been manufactured for some years largely from imported ores. At Port Arthur the new Atikokan blast furnace is in operation. Thus Ontario may boast of a fair start in the iron industry. But vast fields of iron ore still lie untouched. In Northern Ontario deposits of great promise exist. In Eastern Ontario proved bodies of ore are found in places favorable for shipment to a lake port. Limestone there is in abundance. There are several points on Lake Ontario where iron ore, limestone and coke could be assembled at prices well within commercial limits. Rich as Cobalt is, it will play no such part in the future of this Province as will the iron ores.

On another page the Secretary of the Canadian Mining Institute replies to our editorial of August 1st. We do not wish to make extended comment upon any of the points raised until further discussion has taken place. But it must be borne in mind that our suggestion was constructive and not destructive. To our mind the Institute can be made more useful. We hope that all concerned will look upon the question from the point of view of the Institute. The matter of personal feeling, so far as THE CANADIAN MINING JOURNAL is concerned, will not be allowed to affect the question in the slightest. We fear, however, that the ardour of the Secretary has led him somewhat far afield. The merits or demerits of the executive are not under discussion. The various officers of the Institute are worthy and blameless men. But the Institute, as a corporate entity, does not take as active a part in mining affairs as many of its members desire it should.

TWO SPECIMENS AND THEIR BEARING ON THE GOLD MINING INDUSTRY OF NOVA SCOTIA.

By E. PERCY BROWN, S.B.

The photographs on the cover of this issue of THE JOURNAL illustrate two specimens of gold ore as found in Nova Scotia.

If the reader will carefully compare the photographs he will be able to appreciate what the writer considers is one of the chief reasons why the gold mining industry of Nova Scotia occupies the position that it does to-day.

The specimen on the left is a typical example of what is generally regarded as characteristic of Nova Scotia gold ore.

It is unfortunately a fact that the average miner of this Province, even to-day, pays little attention to any other class of ore. He believes that his eyes are the best guide as to the value of any ore, and, as he expresses it, he wants to see the gold sticking out of the rock. Further than this, the Government of Nova Scotia, by exhibiting just such specimens of gold ore as this wherever the ores of the Province are shown, tend to impress this very point upon the minds of the mining public the world over. The consequence is that when one hears or sees a reference to gold mining in Nova Scotia he finds that it is classed as hazardous and uncertain, and the deposits are said to be pockety.

The second specimen, showing merely some mineral (arsenopyrite) distributed through a dark blue quartz and slate, represents what is generally known as low grade ore. It is unattractive to the ordinary miner, who views with suspicion the man who tells him that such ore is worth $6 per ton. If he does believe the statement he interprets it to mean that a large amount of capital would be necessary to work such an ore and that

ordinary free milling practice would not save enough of the values to make a paying proposition.

Now what are the facts regarding the comparative value of the ore represented by the two specimens?

Both come from the same vein or belt. That portion of the belt from which specimen No. 1 is taken averages in value from 50 cents to 75 cents per ton and does not pay to handle. The specimens are of course very pretty in themselves, and if there were enough of them the ore would be all right, but it is sometimes a long way between the specimens, and that portion of the belt carrying the gold is but a small fraction of the whole and it is impossible to separate it by sorting, so that as a sound business proposition this portion of the belt is a failure.

Specimen No. 2 comes from a portion of the ore body that has yielded an average return by free milling alone of $5 per ton, and an extra 50 cents or 60 cents by further treatment.

Can there be any question as to which is the more profitable ore?

I believe that if this so-called "low grade" ore were thoroughly exploited throughout the Province that mining would assume a very different aspect.

It may be doubted in some quarters that there is a profit in handling ore yielding $5 per ton in a small mill, say 10 or 20 stamps. This can be answered by stating that on a certain property in Nova Scotia a large inclined shaft 10 by 12 feet is being sunk on the ore body at a cost of $12 per foot, one air drill being used. This cost covers all expenses underground except timbering, the cost of which is very small. This does not include the cost of hoisting and the power for drills.

It may thus be seen that sixteen tons are mined at an expense, outside of the items stated, of $12, or 75 cents per ton. Any mining man can judge whether or not a yield of $5 per ton under such circumstances would cover all expenses and leave a margin of profit, even as a ten stamp proposition.

The Toronto Meeting of the A.I.M.E. Visit to Cobalt and other Mining Districts.

In our last issue an outline was given of the meetings of the Institute to Toronto on the 23rd and 24th July. The visiting members, together with representatives of the Ontario Government and a considerable number of Canadian mining engineers and press representatives, left Toronto on the evening of the 24th on a special train for the Cobalt district. The special train consisted of ten Pullman cars and two diners. The party numbered about two hundred.

The Hon. Frank Cochrane, Minister of Mines, took official charge of the visitors. He was assisted by the Hon. Dr. Pyne, Minister of Education, and by the Toronto and various other local committees.

On arriving at Cobalt the party was met by the following committee: Mr. A. A. Cole, representing the T. & N. O. Ry.; Messrs. R. W. Leonard and D. B. Rochester, from the Cobalt Chamber of Mines; Messrs. Running and Martin, from the Cobalt City Council; Messrs. McLeod and Farland, from the Township Council of Coleman, and by a special committee to guide the occupants of each car through the leading mines. The party was divided into sections, each section visiting four or five mines. Camp dinners were served at the Coniagas, Nipissing and Cobalt Central Mines.

New Liskeard was reached at 8 p.m., and his Worship, Mayor Blair, at the head of a deputation, read an address of welcome. Headed by a band, the visitors then proceeded to the steamer "Meteor," and the evening was spent in a moonlight excursion on Lake Temiskaming. Speeches were made on the return trip.

On the morning of July 26th Cobalt was again visited. In the afternoon an excursion was taken on the steamer "Meteor" from Haileybury. On the return of the "Meteor" the members of the Haileybury Club entertained the delegates. Dinner was served in the grill room, and the evening was devoted to speech-making, interspersed with music.

The special train left Haileybury for Temagami (about 36 miles south) early on the morning of Saturday, July 27th. The deposit of iron ore near the station was inspected. In the afternoon the steamer "Bell" was boarded, and the visitors were taken up the beautiful Lake Temagami. At Temagami Inn (12 miles up the lake), and at Lady Evelyn Hotel, on Lady Evelyn Lake, Sunday was spent quietly.

Sudbury was reached on Monday morning, where the Sudbury Local Committee met the train. At the invitation of the Canadian Copper Company, their plant at Copper Cliff was inspected, and the Creighton Mine was visited. At the latter place a camp dinner was served. In the evening a complimentary banquet was tendered to the Institute by the citizens of Sudbury. Lennon's Opera House, in which the dinner was held, was superbly decorated for the occasion. Covers were laid for 250 guests. Many notable speeches were made in response to the toasts.

On the following day the Moose Mountain Iron Mines (30 miles north of Sudbury) were visited. Here also a typical camp meal was enjoyed, under a temporary roof erected for the occasion. In the afternoon the Vermilion placer gold workings were the object of brief inspection. At North Bay many of the party left. The return to Toronto was marked by a mock trial and by an unpremeditated expression of appreciation to the Hon. Mr. Cochrane by the American delegates.

Space will not permit of reference to many of the pleasant features of the trip. The citizens of Cobalt, New Liskeard, Haileybury and Sudbury spared no pains to extend the heartiest possible welcome to each and all of the delegates. The O'Connor Steamboat Company most courteously put their steamers at the disposal of the visitors on Lakes Temagami and Lady Evelyn. At Cobalt the Local Committee presented the whole delegation with brooch pins of native silver. Incidentally, the silver was supplied by the Trethewey Mine.

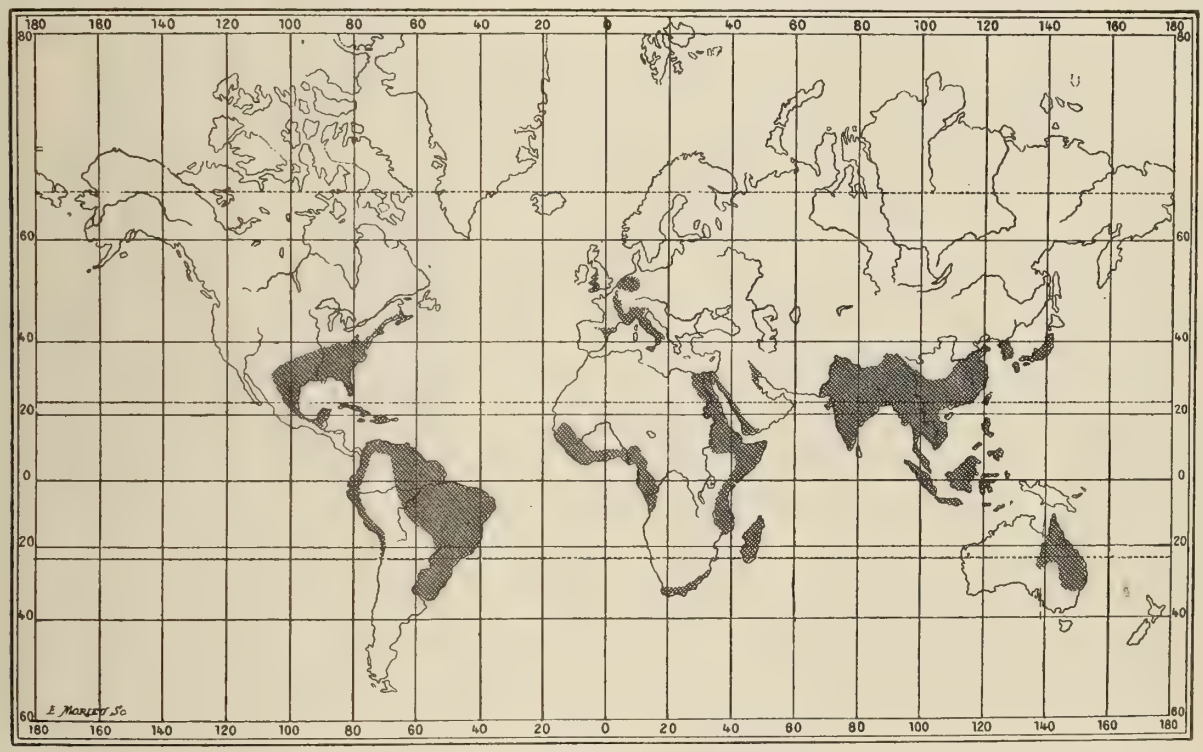
It was the intention of THE CANADIAN MINING JOURNAL to publish in this number a much fuller account of the meetings and itinerary of the American Institute's Ontario visit. To that end a full stenographic record was made covering all the proceedings and speeches, both in Toronto and at the other points visited. Owing to pressure upon our columns it has been found quite impracticable to utilize more than a small fraction of this material. It has been decided, however, to publish within the next few weeks a compendious handbook. In this will be included historical sketches of the mining districts visited, portraits of the discoverers and pioneers of the mining camps and a full account of the whole proceedings. The volume will be copiously illustrated, both with color plate and with half-tones.

ANKYLOSTOMIASIS

"Miner's Anemia."

By F. W. GRAY.

The mining population of Europe, particularly that portion engaged in coal mining, has suffered considerable pecuniary and physical inconvenience from the prevalence in recent years of a disease variously known as ankylostomiasis, miners' anemia, hookworm disease, etc. Unfortunately, this disease has been given a name of portentous length that unfailingly excites the risibility of mining men who have never come into contact with the "unspeakable worm." The English miners named the disease "hanky-panky," and their bantering attitude has been reflected in other mining districts by men who should have known better, for in many places experience of the ankylostome has been dearly purchased, and could have been avoided had due regard been paid to the warnings of medical men, and had any regard at all been paid to sanitary conditions underground.



Geographical Distribution of Ankylostomiasis

The following notes have been collated from various sources, chiefly European, as the result of somewhat extended reading on the subject. They are written purely from the standpoint of the mining engineer, and it is solely the fact that in the nature of things so few members of the medical profession have any intimate acquaintance with the technics of mining or actual physical conditions underground, that the writer has ventured on a subject so very largely medical, but which, from its intimate connection with and its dependence on local conditions and systems of coal extraction, and from its serious effects on the health and general prosperity of the miner, very largely appeals to the mining engineer, and should be of vital interest to the mining industry in general.

The subject is comparatively new in Canadian mining circles, and a recapitulation of what has happened in European coal districts may serve to put us on our guard against the introduction of ankylostomiasis infection into our coal and ore mines. This is not at all a far-fetched possibility, when we consider the steadily increasing tide of European immigration that is now setting towards our Dominion, and further that our mines are but in their infancy.

Recent literature on the subject of ankylostomiasis in the English language is not very extensive, as the subject has not yet been so forcibly brought to the attention of either England, Canada or the United States as it has been in France, Germany, Belgium, Italy and other European countries.

The principal English authority is Dr. J. S. Haldane, of the Home Office, who is so well known to mining circles by reason of his researches into carbon monoxide poisoning and mine gases generally. Dr. Haldane published a Blue Book in 1902 on the outbreak of ankylostomiasis at the Dolcoath tin mine in Cornwall (1), and in 1903 published a further report detailing the results of his visit to the infected districts of the continent.(2)

Several papers on the subject will also be found in recent numbers of the Transaction of the Institution of Mining Engineers, Eng.(3)

An excellent handbook is published by *The Colliery Guardian* at a nominal cost, which has had an extended circulation.

In the United States much attention has been given to the study on the "hookworm disease" or "uncinariasis" (which is for all practical purposes identical with ankylostomiasis), by Dr. Ch. Wardell Stiles, of the Hygienic Laboratory at Washington, who in 1903 issued a report on "The Prevalence and Geographic

Distribution of Hookworm Disease in the United States,"(4) attached to which will be found a very comprehensive bibliography of general literature relating to ankylostomiasis in various quarters of the globe.

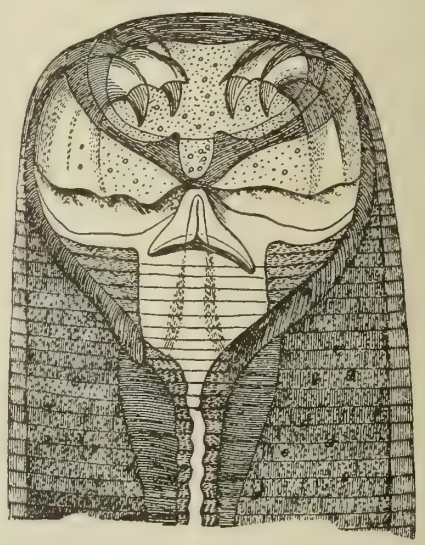
Recent continental writings are more voluminous, and apart from the monumental works of Perroncito, Leichtenstern, Looss, and other eminent European authorities, which are purely medical treatises, reference may be made to the published report of the Commission appointed by the German authorities to enquire into the Westphalian epidemic, and to various articles that have been contributed by medical correspondents to "Glückauf," the semi-official organ of the Westphalian coal operators.

But the most recent and perhaps the most important contribution from the standpoint of the mining engineer is a work published in 1906 by Drs. Calmette and M. Breton, of the Pasteur Institute at Lille(5), which covers with painstaking detail the whole subject, and the authors state in their preface was in part written especially for the benefit of the mining profession. Attached to the work is a comprehensive collection of official documents issued in various countries bearing on the disease, and a chronological index to all literature relating to ankylostomiasis from 1878 to 1904. The work has received the fullest appreciation in England and on the continent, and the authors have been honored at the hands of several learned societies in recognition of their labors. It is to be hoped that the book will some day appear in an English translation. A very free use of the text has been made in the following notes.

As will be gathered from a study of the natural conditions most favorable to the life cycle of the ankylostome, it is chiefly to be found in tropical and sub-tropical countries, and is more especially associated with low-lying and damp localities. In the temperate zones it will as a rules be found only where these conditions are artificially produced. Broadly speaking, the parasite will be found to occur normally on either side of the Equator, between the fortieth parallels (see illustration). Within these limits the disease may be endemic, and the population may be affected as a whole, as in Egypt, where it is stated no social class is immune, or in Porto Rico, where practically every inhabitant is more or less infected. Outside these limits the occurrence of the disease in anything approaching an epidemic form will as a rule be incidental to industrial operations in the course of which an artificial environment is created which is favorable to the propagation of the parasite; such conditions as, for instance, occur in the neighborhood of large brick kilns, in hot, moist, unsanitary mines, and in deep tunnelling. The persons affected, therefore, are likely to belong to distinct industrial classes, and the disease will assume the aspect of a trade malady (Berufskrankheit).

The disease is not new, and Sandwith states that the symptoms of a malady described in an ancient Egyptian papyrus, written so long as 3,450 years ago, leave no doubt that this sickness was well known to the physicians of that far-off day. The first recorded description of the ankylostome itself was given in the year 1838 by Angelo Dubini, who discovered the worms in the intestines of a young Italian peasant who had died in the hospital at Milan.

According to the various authorities cited by Dr. Calmette, ankylostomiasis is endemic over the whole of Egypt, Abyssinia, Ethiopia, along the shores of the Red Sea, and in fact over the African littoral generally. It is fairly widespread among the natives of British Central Africa, which, considered in connection with the fact that ankylostomiasis is common among the agriculturists of Southern China, suggests the advisability of preventive measures in the deep mines of the Rand. In Asia it is found over that portion of the continent extending from India through Cochin China and Siam to China and Corea. It is found in Japan, particularly round Nagasaki, in Formosa, and throughout the whole of the Malayan archipelago. In Australia it exists in the northern portion of the Island, especially in Queensland. In America it affects practically all the continent lying between the fortieth parallels. The American

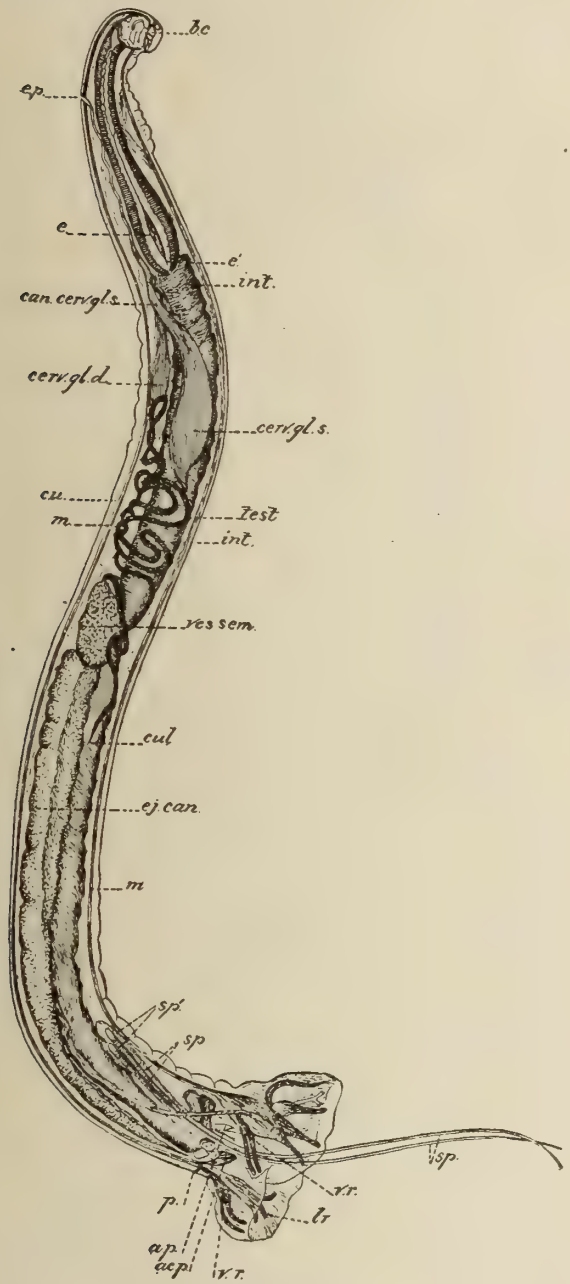


Dorsal view of interior end of the Old World Hookworm greatly enlarged.

species differs in some respects from the Old World ankylostome, but these differences are only minor, precisely the same symptoms being produced by their presence in the human body. Full particulars of the extent of the hookworm disease in the United States may be gathered from Dr. Stiles' report before referred to. Dr. Stiles made a visit to the Southern States in the winter of 1902, studying the disease on the ground, more particularly in the Carolinas, Georgia and Florida, and found the disease widespread, particularly in sandy districts. In his report he writes: "Speaking in general terms, however, the facts at my disposal at present seem to indicate that, taking the Southern Atlantic States as a whole, uncinariasis must be considered as one of the most common and widspread maladies . . . Among the whites of the rural sand districts uncinariasis is apparently the most common disease found." He further states: "In all probability further study will show that in Mexico, Central America and parts of South America, hookworm disease is more important and more common than in the United States." Speaking of the economic bearing of the hookworm disease, Dr. Stiles draws a very depressing picture of the poverty and mental backwardness among the "poor whites" of the infected districts, and to quote further, he says:

(1) Home Office Cd. 1318—1902. Price 4d.
(2) Home Office Cd. 1843—1903. Price 2d.
(3) Trans. Inst. Min. Eng., pages 183-201, 1904; Trans. Inst. Min. Eng., pages 196-211, 1905.
(4) Hygienic Laboratory Bulletin, 1903, No. 10.
(5) L'Ankylostomiase (Anémie des Mineurs), Mason et Cie, Paris, 5 fr.

"Considering the subject in the light of all I saw on the trip, and taking what I believe to be a conservative view of the subject, I find it exceedingly difficult to escape the conclusion that in uncinariasis, caused by *Uncinaria Americana,* we have a pathologic basis as one of the most important factors in the inferior mental, physical and financial condition of the poorer classes of the white population of the rural sand and piney wood districts. This sounds like an extreme statement, but it is based on extreme facts."



Male Hookworm.

In Europe, although known to exist since the date before mentioned, the disease never assumed a serious aspect until the alarming outbreak in the St. Gothard Tunnel in 1879, whence it is extremly probable the infection was carried to other parts of Europe by the exodus of the workmen at the completion of the work. Ankylostomiasis is said to be endemic over a large portion of Italy and the low-lying plains of the Danube and the Theiss in Southern Hungary. The condition of the sulphur miners caused by the extensive infection that exists in Sardinia is truly deplorable. More detailed reference will be made to the disease as manifested in the coal mines of France, Germany and Hungary, at a later stage of these remarks.

In England an epidemic of a mysterious nature broke out at the Dolcoath tin mine in Cornwall, which was eventually traced to ankylostome infection, and this also will be dealt with more fully later.

The *ankylostome duodenale* is a parasitical worm belonging to the nematode order (thread-like). The adult female is approximately one-half an inch in length, the male being shorter and thinner, and easily distinguishable from the female by a characteristic umbrella-like caudal process surrounding the genital organs at the tip of the tail. The adult worm of both sexes is provided with a formidable suctorial apparatus, consisting of a circular mouth opening, furnished with four in-curved teeth, leading to a strongly muscular esophagus which acts like a pump, the whole forming, to quote Dr. Calmette, "a veritable cupping glass." The name of hookworm popularly applied to the ankylostome is not derived, as would at first sight appear, from the hooked teeth with which it is so liberally provided, but from the fact that the head of the worm is bent round like a hook, the mouth being on the under surface.

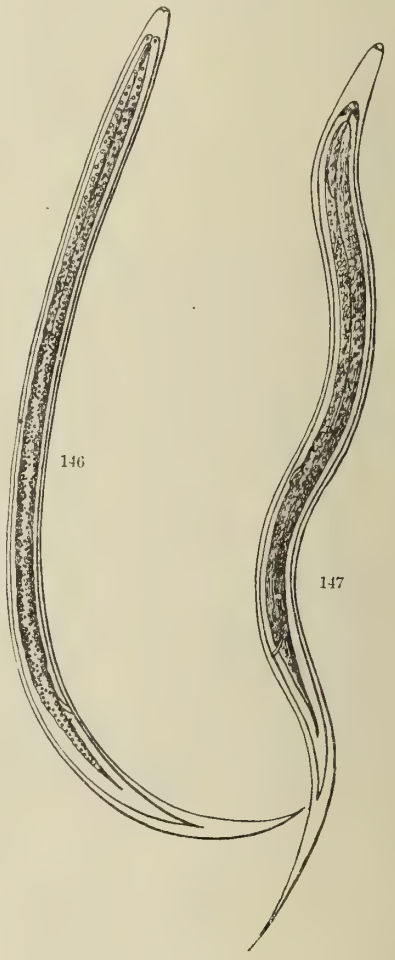
The natural habitat of the adult ankylostome is the small intestine of man. Here the female lays her eggs in enormous numbers, commencing to do so the day after impregnation. The eggs are very minute, about 1-400 inch by 1-700 inch, oval in form, and delicately transparent. They are provided with an inner membrane, which in conjunction with the concentrated fluid interior exerts a great osmotic pressure, and renders the eggs almost impermeable, consequently they possess extreme powers of resistance to outside agencies. They pass out of the body with the feces, usually partially developed, but development to the larval stage in the body itself is prevented by the natural heat and the lack of oxygen in the intestinal passage. After leaving the body the conditions necessary to hatch out the larvae are warmth, moisture, and the presence of oxygen. All these conditions must exist together, and if any of them are absent, development will not take place. Below a temperature of 68 degrees Fahr. or above 98 degrees Fahr. development is retarded or entirely prevented. Given favorable conditions, however, the eggs will hatch out very quickly, the time varying from several hours to two days, according as the conditions are more or less favorable. The young larva is very active, and before hatching may be observed coiling and recoiling itself with extraordinary rapidity within its shell. When it succeeds in breaking out and emerges as a free larval worm it commences to feed voraciously on the fecal matter surrounding it, and grows rapidly, changing its skin on the second or third day. At the end of from four to six days it commences to secrete a vitreous transparent fluid, gradually loses its mobility and becomes rigid, and within four to five days the larva is completely enveloped in a smooth yellowish chitinous capsule, impervious to water, enabling it to resist with ease physical and chemical influences that would have been fatal to it when newly hatched. The larva at this stage possesses remarkable vitality, and has been observed by Looss to live for a period of 300 days when immersed in water, which is said to be a medium well suited for the preservation of the encysted larvae. They have also been known to resist desiccation prolonged over five days.

This stage completes the development of the ankylostome outside the human host, and it awaits an opportunity to gain entrance to the body. It was formerly supposed that the larva of the ankylostome could develop into a sexually mature free rhabdite capable of producing eggs and disseminating infection outside of the human organism, but this theory is not now accepted. The encysted larvae may gain entrance to the body either through the mouth by swallowing or through the pores of the skin. The possibility of this latter mode of infection was for some time disputed by several medical authorities, especially in Germany, but the extensive researches of Dr. Looss, of Cairo, whose conclusions are endorsed by Dr. Calmette and Dr. Haldane, have proved, beyond doubt, that the encysted larvae can penetrate the pores of the skin, pass with the blood stream to the lungs, and from there find its way into the esophagus and finally the stomach.

A peculiar feature of the recent epidemic at Dolcoath, Cornwall, was the prevalence of pustular cutaneous eruptions known by the miners as "bunches," and many authorities record instances of cutaneous infections accompanying ankylostome infection. These eruptions occur more particularly on those portions of the body which are exposed to contamination by dirty water or mud, the chief vehicles of infection. The encysted larvae, being able to resist a comparatively long period of dryness, can also, according to Calmette, be transported by air currents, and may find entrance through the respiratory organs, but this mode of infection is probably exceptional.

When the encysted larvae reaches the stomach the protective covering of chitin is softened and loosened, permitting the worm to disengage itself from its envelope, for which it has no longer any need. Dr. Calmette remarks that the envelope is not dissolved by the gastric juices as has been supposed, but merely relaxed, he having found both the pancreatic and intestinal juices quite negative in their action on the material of which the covering is composed. After remaining in the stomach sufficiently long to divest itself of its covering—the stay there never exceeding fifteen hours—the liberated ankylostome passes into the duodenum. Here its growth is at first slow, but after a week a provisional mouth cavity makes its appearance, which is gradually modified, until finally the complete dental apparatus with its four curved teeth is perfected, and in from four to five weeks after the infection the sexually perfect adult ankylostome is evolved and another cycle commences. The worms attach themselves by their teeth to the mucous lining of the intestines, in which they bury their heads deeply, sometimes indeed they penetrate to the submucous membrane and exist in a sort of blood bath. They do not remain in the same spot all the time, but move about from place to place, so that the bites are more numerous than the actual number of the worms. If no fresh infection occurs the worms will decrease in numbers and gradually die off, but they have been known to live from five to seven years in the intestines.

It does not appear that the ankylostome duodenale can exist in any other host than man. Various experiments have been tried to infect pit horses, mine rats, rabbits, dogs and mice with preparations of ankylostome larvae, but with entirely negative results. Dr. Bruns, of the Gelsenkirchen Institute of Bacteriology, speaking before the Berlin Conference on Ankylostomiasis in 1903, detailed some experiments on higher anthropoid apes brought direct from the Tropics. The animals were given food containing the encysted larvae of the ankylostome, and microscopical examination of their feces, after the lapse of the ordinary incubation period, revealed the presence of ankylostome eggs in no wise to be distinguished from those contained in human feces. The eggs developed to young larvae, also exactly resembling the ordinary young ankylostome, but the adult worms were quite dissimilar, being unencysted, longer, more active and incapable of reproduction. The ankylostome would appear, therefore, to possess an organism highly specialized for life in the human body, and incapable of reproducing itself except in the manner previously described. The worms cannot reproduce inside the body, and therefore for every adult worm present the host must have absorbed an encysted larva. Direct infection from person to person is not possible, actual contact with contaminated matter being necessary to contract infection.



Two Larvae in second stage.

The symptoms accompanying the presence of large numbers of ankylostomes in the human organism and constituting the diseased condition known as "ankylostomiasis" bear a marked resemblance to those accompanying pernicious anemia and the chlorosis of young women. The skin of the face becomes pale, assuming a waxy appearance as the disease advances; the mucous membrance of the lips and the inner surface of the eyelids become bloodless, and the tips of the ears have a greyish hue. Pains are experienced in the region of the stomach, sometimes accompanied by distention of the abdomen.

Diarrhoea is a feature of the disease, originating no doubt in the intestinal irritation set up by the worms, and this alternates with an obstinate constipation. The

feces present often a brownish or reddish cast owing to the bleeding of the intestines from the bites of the worms. As in all diseases of this nature, the appetite is capricious and irregular, sometimes abnormal and at other times poor. The taste becomes perverted, the sufferer evincing a desire for such things as pickles, salt and dirt. Dr. Stiles makes extensive remarks on this feature, which occurs very frequently among the "poor whites" of the Southern States, where he found cases of "sand-lapping," "resin chewing" and "dirt eating," and he remarks that this perversion of taste may be "classed with the chewing of slate pencils, resin, coffee, sucking of lemons and salt, etc., as an abnormal appetite due to the anemia and abnormal condition of the intestinal tract."

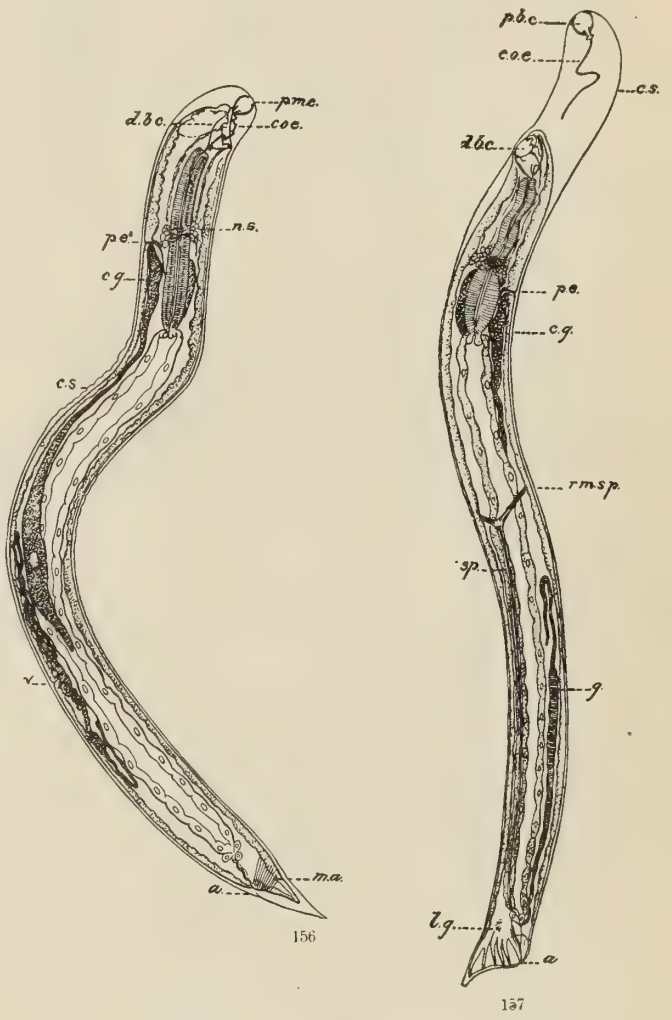
The affected person suffers from dizziness and palpitation, and from shortness of breath on the least exertion; he has frontal headaches, becomes extremely sensitive to cold and loses all desire for work. In the final stages of the disease dropsy may supervene, and the sufferer is reduced to a condition of general debility that renders him an easy prey to other diseases. In some cases affections of the skin may be present, as before mentioned, and a bronchial catarrh has been noticed by Belgian doctors as sometimes accompanying the other symptoms. These latter symptoms are probably due to the irritating effect of the larvae when effecting their entrance through the skin, but the main symptoms are without doubt the result of the anemia consequent on the altered condition of the blood, which is the most prominent result of the presence of the worms. The proportion of the red corpuscles in the blood is largely reduced, and a distinctive feature is the marked increase in the proportion of eosinophile leucocytes (colorless corpuscles of the blood, so-called from the fact that they are readily stained by eosin), which under the miscroscope afford a means of diagnosis that has been found of value.

The symptoms of course are progressive, and are not the same in all cases, the resistance of the individual playing an important part. The severity of the anemia is dependent on the number of the parasites present in the intestines and the length of time they have been there, modified by the powers of resistance possessed by the person attacked. Some persons may carry numbers of the worms quite unconscious of the fact, and to all appearance possessing good health. This fact led the German doctors to separate their ankylostomiasis patients into two classes—"worm-carriers" and "worm-sick." The first named class included those persons whose dejecta contained the ova of the ankylostome, but who were not apparently unhealthy. The second class was composed of those in whom the ravages of the worms had so far advanced as to present all the characteristics of a disease, the patient being visibly anemic, and exhibiting plainly the peculiar symptoms of ankylostomiasis.

The blood-sucking propensities of this creature, while sufficiently serious, do not altogether explain the marked alteration which takes place in the character of the blood, and several authorities incline to the opinion that the parasite secretes a toxin which causes this altered percentage of the blood constituents. Sandwith, referring to fatal cases of ankylostomiasis that had come under his observation, states:—

"The actual cause of death was exhaustion from utter absence of rallying power. It is difficult to believe that the pathological effects are induced only by hemorrhage from the daily suction of scores or even hundreds of worms. In addition to this loss of blood we have general thickening and degeneration of the duodenum and jejunum, and consequent interference with normal digestion; then non-assimilation, and eventually a process of slow starvation. It is also worthy of note that there may be in prolonged cases some self-poisoning from the great number of bites in the intestines containing ill-digested and perhaps decomposing food."

In prolonged and severe cases of ankylostome infection the outward symptoms of paleness, etc., are sufficiently obvious, but, as before mentioned, not all "worm-carriers" exhibit outward symptoms, and the recognized and perhaps the only absolute test for the presence of the worms is microscopical inspection of the feces for the ova of the worms. Dr. Stiles gives a quick and ready method for preliminary diagnoses of suspected cases. About an ounce of flesh feces is placed on a



Male and Female Hookworm before the fifth casting of skin. 14 to 15 days old.

sheet of white blotting paper and allowed to stand for from twenty minutes to an hour. In medium or severe cases of ankylostomiasis a reddish brown stain will be left on the blotting paper. The blood examination for ankylostome infection is based on the proportion of eosinophiles. The finger of the person under examination is pricked with a needle, and the resulting drop of blood is smeared on a slide, which before examination under the miscroscope is treated with eosin dye. This method is quicker and less repugnant than fecal diagnosis, and while not absolute, as there are other intestinal parasites which have a similar effect on the blood corpuscles, it is still very accurate, and affords a rapid

and cleanly method especially applicable to the preliminary selective examination of large numbers of men. It has been largely used in England by Dr. Haldane in connection with his enquiries in the mining centres of that country.

Thymol and male fern are the two drugs usually administered to expel the worms. Thymol is preferred by the American and English profession, while in Germany extract of male fern has been very generally used in connection with the Westphalian epidemic. The use of these drugs is not unattended with danger where the patient is weak, but as a rule two and rarely three doses are sufficient to expel the worms. In some cases, however, repeated doses will not do this, more especially where the infection is of long standing. After the parasites have been removed the delibitated constitution of the patient requires to be built up by means of a nourishing diet and the administration of iron in some form. Where the disease has not progressed too far the patient will usually make a rapid recovery, but after a certain stage the health remains permanently impaired, even when the worms have been all expelled.

(To be continued.)

SOME REFLECTIONS IN SECRECY ON THE ARTS.

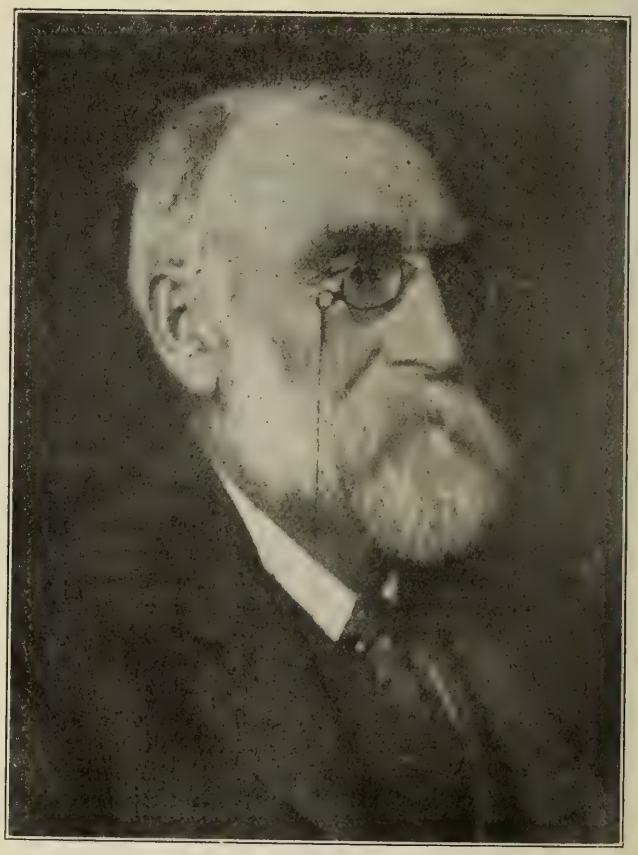
Dr. James Douglas

(Paper read Toronto meeting A. I. M. E.)

Though liberality is not supposed to be a prominent trait of the Scottish character, Canada owes to a Scotchman, Sir Wm. Macdonald, more than to any other of its people, not only wise ideas, but pecuniary help towards extending education. And another Scotchman in New York has sumptuously housed under one roof three branches of the engineering fraternity. Being thus created the members of the same family—for the metaphorical meaning of house and kinship is identical—Mr. Carnegie expresses more emphatically than even he could in words, that by affording facilities for closest intercourse, he invites the mechanical, electrical and mining engineers to participate in the freest interchange of ideas and experiences, and to correlate and combine the results of their studies and activities, and, being members of the same household, to banish reserve and secrecy.

And now we, the members of the American Institute of Mining Engineers, meet as though we were at home in a neighboring country. For whether we meet in Canada, in England, or elsewhere, the association is always received as though no political or geographical divisions separated its members from those of congenial incorporations in the land of its host. In fact the title which we have assumed claims for the sphere of our activities the whole American continent, regardless of such trifling details as boundary lines.

The fact that we meet to communicate each other's experience, to discuss our difficulties, and to seek each other's aid in solving the intricate problems that so often present themselves in the course of our professional life, is an acknowledgment of our individual helplessness; and therefore an argument for united effort. But no effort can be of any value if there is an underlying suspicion of reserve and lack of candor in our treatment of the technical questions which it is our province at these meetings to discuss. And yet there are limits to the extent to which we may go as officials of public companies. We know that even as professional men it is not always easy to reconcile principles with practice, and on this subject of sincerity and transparent diffusion of our experience there is both difference of opinion and difficulty of application. Few of us are as favorably situated as the college professors, whose first duty is to unbosom themselves to their students of all they know, and perhaps of a little they only suppose they know. We are most of us paid officials of corporations whose *raison d'etre* is to make money, and whose executive officers sometimes, not without some reason, consider their trade secrets as part of their capital. Some companies confide these secrets to the honor of their technical workers under as strict rules as those imposed on their cashier in the distribution of their money. Unless, therefore, our employers permit, we as employes are under pledge of secrecy. Many large



DR. JAMES DOUGLAS

manufacturers and mining and metallurgical concerns put no restriction upon the freedom of their technical staff, but some of our largest certainly impose on their employes absolute silence as to all that transpires within their laboratories or workshops.

If the question were left to ourselves, it would be easy of solution. Our reliance on one another as workmen in such distinct branches of engineering as civil, mechani-

cal, electrical and mining, is so close that we must co-operate in every large enterprise we undertake. We cannot succeed singly, for few of us claim to be so encyclopaedic in our knowledge or universal in our experience as to make it safe to rely on our own acquaintance with the practical details of every one of these important departments. We therefore seek each other's assistance, and consequently share in each other's secrets, for every man's special knowledge is to the other man, who is more ignorant or inexperienced a secret, or "a mystery," as old tradesmen and professional men used to call it.

Every industrial advance brings us closer together and makes it more impossible to act independently. Till very recently the civil engineer surveyed and located the line of railroad; the metallurgist made the rails and the iron and steel for the locomotives; the mechanical engineer designed the equipment, and what was left for the electrician to do was to string the telegraph wires. Now all this is changed. The electrical engineer is, in importance, springing into the first rank, and he requires such special acquaintance with the mysterious forces whose distribution and useful energy he handles with so much audacity, and yet safety, that few of us are particularly anxious to meddle with it.

Or take a mining instance—when called on to decide as to the adoption, in underground or overground haulage, of electricity or compressed air, even in metalliferous mines, the verdict must depend on so many delicate and purely technical considerations that few superintendents or general managers would consider themselves sufficiently informed to commit themselves, until their mechanical and electrical advisers had marshalled all the facts and arguments for and against each system. I need not cite other instances in which co-operation is demanded in the carrying out of almost every modern enterprise, or in the equipment of the complicated mechanisms which have replaced the simpler contrivances of our forefathers. The modern steamship exceeds Columbus' caravels in size and in complexity of construction as much as does a limited train an old stage coach. And in proportion to the multitude of their parts and the tremendous energy of the forces which must be called into play to move them, is the diversity of knowledge, talent and skill required to design, construct and operate them. As I have said, therefore, if it depended upon ourselves, there would be no difference of opinion as to the necessity of perfect open-mindedness, and as little backwardness in applying the principles to practice.

I think, moreover, that many of us are also convinced that open-mindedness to the suggestions of others is a useful quality to carry into our work, even after we and our scientific staff, in our wisdom, have co-operated in formulating and laying out our plans. Every draftsman in our office, every master mechanic in our shops, every foreman in our mines, is an expert in his particular line, and may be supposed to be familiar with minutae which have escaped our observation, or, to put it frankly, may know more than we do ourselves on some of the innumerable details which make up the sum total of the questions on which we have ultimately to pass. The suggestions coming from such subordinate sources may not always be worthy of acceptance, but on the other hand it is never wise on our part to turn a deaf ear or a disdainful shoulder to them. In our own small way we feel sometimes almost ashamed at the credit accorded to ourselves, for ingenuity and foresight in devising either mechanical or industrial novelties, or in organizing large schemes when we recall the hints from others which have suggested thoughts to ourselves. For though undoubtedly even in the most imposing cases the one inspiring mind may have conceived the idea, either of the invention or of the enterprise, only by the co-operation of a number of subordinate agents, who often belong to the multitude of the unknown and forgotten, could the idea have been worked out to the glory and the profit of the inventor or promoter. It is always difficult to decide how much of the result should be passed to the credit of the conspicuous man and how much to that of the hard-working, plodding, unimaginative grubber among details, or to the brilliant, erratic and because erratic, unsuccessful fellows who do so much of the world's work, and yet get so little of the credit or the gold. But this is certain that in our own work, whether it be conspicuous or not, we will always benefit by inviting suggestion from the humblest of our co-operators, and encouraging them to think independently and not to be afraid of expressing their thoughts. That this is already one of the prominent qualities of American industry is manifest from the large number of patents which are taken out by inconspicuous laborers in the field of engineering—especially in that of mechanics.

I recently went one Friday morning into our purchasing department, and found every desk empty, and all the clerks assembled in the manager's room. He had found it conducive to the most efficient conduct of his office to assemble all his staff once a week for free discussion as to the most economical distribution of work. The consequence was that instead of late hours and overtime, the result was obtained very easily within office hours, for suggestions from the men actually engaged were found to be worth more than from those merely superintending. The youngest were not snubbed, if they ventured to make a remark, and thus the spirit of pride and co-operation pervaded the whole group. We have all heard how Mr. Carnegie is said to have stimulated the rivalry of his superintendents and heads of departments by getting them to meet at intervals over an excellent lunch, where around the table all jealousy vanished, and all little technical secrets which are liable to exist even among friends were revealed. But good cheer is not, or should not be, necessary to make the great brotherhood of technical workers unfold their sympathy and unbosom their secrets to one another.

But to return to our main subject. How far and how completely should even corporations and industrial concerns permit and encourage the interchange of information? I am inclined to think that few limits should be set, for every limitation means the concealment of some fact or some principle which only if revealed can be developed to its full significance and utility. As a rule this can be done only by the action of many minds and many hands. Till developed it does not yield its full advantage to even the original discoverer, for he alone, unaided, in the solitude of his laboratory or behind the bars of his factory, without the practical assistance of his fellow-workers, rarely brings his original germinal idea into efficient, practical utility.

Were we free to appeal to purely altruistic motives, it would therefore be superfluous to argue in favor of complete knowledge and experience-sharing, but profit-sharing is after all the impelling motive of industrial advance to-day, as it has been in all ages, and to reconcile the admitted evils of secrecy with the admitted advantages of publicity, the patent laws have been framed. They have always given the patentee the right to use in either his person or through his agent his inventions or discoveries for a limited number of years, provided he

describes it so fully that it can be practiced by one skilled in the art. The publicity and knowledge conveyed by the specification stimulates the inventive faculties of others, and patented and unpatented improvements along the line of the original invention demonstrate both the value of publicity and the cupidity of men even of the technico-scientific class. Among the great inventors of our day was Sir Henry Bessemer. Before the Royal Commission appointed to suggest revision of the British patent laws, he gave evidence, some of which he has embodied, with very suggestive comments, in his autobiography. Before he became famous he devised machinery for making bronze powder, and manufactured in secret. Of this he says:—

"While referring to patents for inventions, I cannot refrain from pointing to this particular invention of bronze powder as an example that may advantageously be borne in mind by those short-sighted persons who object to grants of letters patent. There can be no doubt of the fact that the security offered by the patent law to persons who expend large sums of money and valuable time in pursuing novel inventions, results in many new and important improvements in our manufactures, which otherwise it would be sheer madness for men to waste their energy and their money in attempting. But in this particular case the conditions were most unfavorable for patenting, owing to the fact that the article was only a powder and could not be identified as having been made by any particular form of mechanism. Therefore it could not be adequately protected by patent. Moreover, by my machinery, the cost of production, if only paid for at the ordinary rates of wages, did not exceed one-thirtieth of the selling price of the article. This fact alone offered an irresistible temptation to others to evade the inventor's claims, and so rendered the patent law a most inadequate protection. On the other hand, the great value of a small bulk of the material made it possible to carry on the manufacture in secret, and this method of manufacture was rendered the more feasible by making such different class of machine self-acting, and thereby dispensing entirely with a host of skilled manipulators. It may, therefore, be fairly considered, so far as this particular article was concerned, that there were, in effect, no patent laws in existence.

"Now let us see what the public has had to pay for not being able to give this security to the inventor. To illustrate this point, I may repeat the simple fact that the first order of bronze powder obtained by my traveller was for two pounds of pale gold, at eighty shillings per pound net, for the Coalbrookdale Iron Company. I may further state that, in consequence of the necessity for strict secrecy, I had made arrangements with three young men (my wife's brothers), to whom were paid salaries far beyond the cost of more manual labor (of which, indeed, but little was required). My friend, Mr. Young, desired to occupy the position of sleeping partner only; so I had entered into a contract with him to pay all salaries, find all raw materials, pay rent, engine power, and bring the whole produce of the manufactory into stock, in one ounce packages, ready for delivery, at a cost, for all qualities, of five shillings and sixpence per pound; after which he and I shared equally all profits of the sale. It is rather a curious coincidence that the one ounce bottles of gold paint were labelled five shillings and six pence, of which the retailer was allowed a liberal discount.

"Had the invention been patented, it would have become public property in fourteen years from the date of the patent, after which period the public would have been able to buy bronze powder at its present market price, viz., from two shillings and three pence to two shillings and nine pence per pound. But this important secret was kept for about thirty-five years, and the public had to pay excessively high prices for twenty-one years longer than they would have done had the invention become public property in fourteen years, as it would have been if patented. Even this does not represent all the disadvantages resuling from secret manufactures. While every detail of production was a profound secret, there were no improvements by the outside public in any one of the machines employed during the whole thirty-five years, whereas during the fourteen years, if the invention had been patented and published, there would, in all probability, have been many improved machines invented, and many novel features applied to totally different manufactures.

"I have lingered long over this subject of bronze powder, because it is one which has had great influence on my career; it was taken up at a period when my energy and endurance, and my faith in my own powers, were at their highest; and as I look on all the incidents surrounding it, through the lapse of time and the many changes of the fifty years since it was undertaken, I wonder how I had the courage to attack a subject so complicated and so difficult, and one on which there were no data to assist me. There were not even the details of former failures to hold up the finger of warning, or point out a possible path to pursue, for no one had yet ventured to try and replace the delicate manipulation which experts had made their own, both in Japan and China, where texts and prayers printed in bronze were offered up at the shrine of Confucius two thousand years before I had ever seen a particle of bronze powder."

He concludes this first reference to his powder in the following paragraph:—

"In closing these details of the bronze powder manufacture I may say that later on the handsome royalties paid by my steel licenses rendered the bronze powder business no longer necessary to me as a source of income; and I had then the extreme satisfaction of presenting the works to my brother-in-law, Richard Allen, who had, with so much caution, successfully kept, for more than thirty years, a secret for which, he perfectly well knew, some thousands of pounds would have been given him at any moment."

But he returns to the subject of patents when discussing another invention of his life, that for making optical and plate glass, the value of which for some reason or other the trade has never appreciated. He says: "There is one point in connection with patented inventions upon which I have always felt strongly. I have maintained that the public derive a great advantage by useful inventions being patented because the invention so secured is valuable property, and the owner is necessarily desirous of turning that property to the greatest advantage; he either himself manufactures the patented article, or he grants licenses to others to do so. In either case the public reaps the advantage of being able to purchase a better or cheaper article than was before known to them, due to the inventor's perseverance in forcing his property upon the market. But if a novel article or manufacture is simply proposed by a writer and published in the technical press or in newspapers, as a rule (almost without a single exception) no manufacturer will go to the trouble and expense of trying to work out the proposed invention. He says to himself:

'I shall not risk the expense necessary to develop this new idea, for it may entirely fail; or even if I succeed, its development will cost me much more than it will cost other manufacturers, who will immediately avail themselves of it if I succeed; no, let some one else try it'; and so the invention is lost to the world in consequence of having been given away. This loss to the public is equally the case with patents that are not taken up; and one of the simplest and most effective inventions which I have ever made may be here cited as an example, as it formed part of the novel system of plate glass manufacture just referred to."

After describing his plate glass invention and its public neglect, he says: "From what I have said I think I have shown that, however self-evident an invention may be or however advantageous it might be to a manufacturer, if it is public property he will not touch it."

Sir Henry was doubtless correct in asserting that under the impulse of self-interest inventions are pushed by the inventor more vigorously than if he had merely the scientific credit due and given to investigators to spur him on. But he really gives us an argument against patents when he describes the apathy of the public to his glass patents. His steel patents he worked out himself and brought to perfection after years of heavy expense and labor, and by adopting certain modifications to fit special cases. His plate glass patents he owns himself, but they would probably have been loaded down with royalties which the trade did not care to pay while taking the risk of applying them to practice. As to his bronze powder, he would probably have made far more out of it had he reduced the exorbitant prices and increased the demand, even while manufacturing it behind closed doors. But it is foreign to my purpose to discuss the patent laws, except casually as they bear upon the subject of secrecy in the arts. Sir Henry's generalizations are substantially correct, but they are too sweeping, for there have been great inventions which the public has not been backward in using, though they were gratuitously offered to the world. One's thoughts pass with pleasure from the contemplation of the money-making inventors and investigators to such prophets and apostles of science as Sir Michael Faraday. Sir Michael's profound and original investigations into electricity and magnetism gave the world the dynamo. Though he did not work out the mechanical details of a practical generator, he undoubtedly invented appliances which might have been used for making a a strong basis claim for a patent. But nothing could have been more repulsive to his spirit or foreign to his high aim in life than gauging his time and talents by a mere money standard. He lived contentedly on the small salary he received from the British Institution, preparing his lectures to children with as much care as he bestowed on those delivered before the Royal Institution which made him famous; turning his great learning and power of investigation to the nation's good in return for very scanty remuneration, for he had deliberately decided to devote his life to scientific research for truth's sake, rather than to use his vast attainments in the service of mammon. At the commencement of his career, Faraday added to his salary from the Royal Institution by what he called "commercial work." At first his average earnings from this source were £240 per year. They reached by 1831, £1,831. By 1838 this had shrunk to nothing, for in the meantime his great discovery of magneto-electricity was made, and his whole soul was so absorbed in his experimental work that neither time nor energy could be spared for money-making.

(To be continued.)

LE ROI MINING COMPANY, LIMITED, ROSSLAND, B.C.

By Geo. A. Ohren.

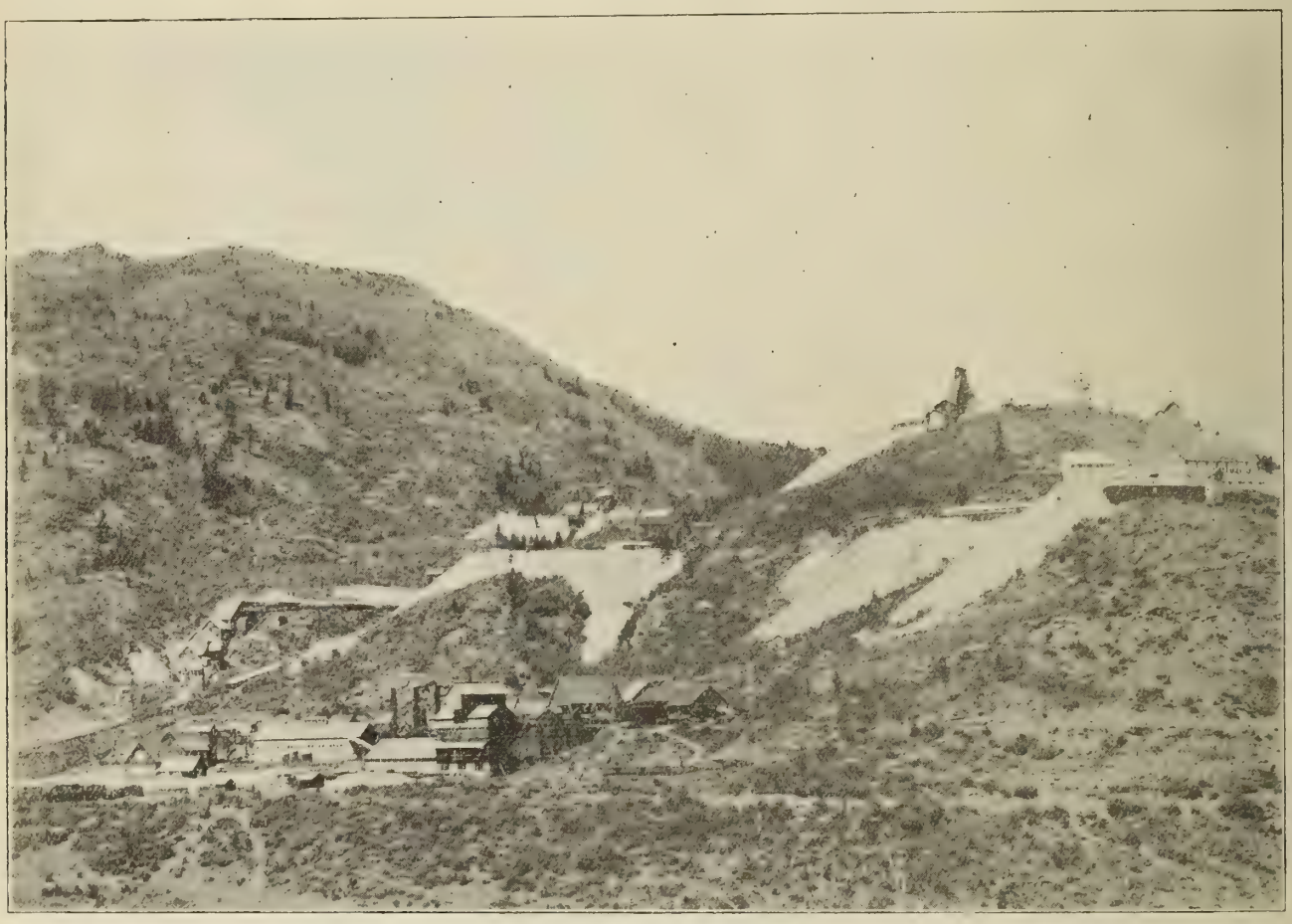
Le Roi group, located on one of the richest portions of Red Mountain, and within the corporate limits of the City of Rossland, B.C., has had a rather varied career and history, since it was first staked, in July, 1890, but it is obvious at the present moment, even to the most casual observer, that the affairs of this concern are on the ascending side of the prodigious wave of prosperity that is now sweeping the country, and with good management, such as it would appear is in effect at present, is bound to attain the goal of successful mining.

Under the effective supervision of Mr. A. G. Larson, superintendent, a very extensive campaign of development work has been carried on during the past several months; the main five-compartment shaft has been deepened from the 1,050 foot station to the 1,650 foot level, and the work of opening up large known ore bodies from the 1,650 level will soon be in full progress. Owing to the sinking and retimbering of the main shaft, and to much diamond drill work and drifting being done, the mine management has had to work assiduously to make both ends meet. But working on this basis, that is, shipping an average quantity of ore and doing an extended amount of development work, is surely good mining practice, under the conditions that existed when this work was inaugurated. The mine is in a position at the present time to hoist and ship a large tonnage of ore of good quality for some time to come, with average development work, which will no doubt result, in the impending months, in excellent profits, unless of course some now unforeseen factor creeps in. But this is hardly probably, as Le Roi is a gold mine, and a financial crisis or fall in the price of copper would hardly affect its operation, while as far as labor is concerned, it is on the most amicable terms here with the employer and wages have recently been advanced about 20 per cent., drill runners now getting $4 per day of eight hours, and other labor in proportion.

The mine is at present producing about 2,500 tons of first-class ore per week, but they are gradually getting additional furnaces into operation at the Northport smelter, lack of fuel and labor having held them back somewhat, up to the present, and the day is not far away when the above shipments will be greatly augmented. The principal development work now under way is the connecting of a winze, from the 1,050 to the 1,650 levels, with the main shaft by a drift on the 1,650 foot level. This work has been held back somewhat by the retimbering of the shaft, which was more of a task than a few words imply.

A short while ago the Le Roi Mining Company bonded the Spitzee group of claims, which adjoin Le Roi properties on the south, and they are now doing considerable work on this property. The rich Spitzee lead was discovered when the Canadian Pacific Railway Company cut through a knoll on that property. Some of the best ore in the camp has been found in the Spitzee workings, but not in very large bodies so far, which consist of a shaft, about 200 feet deep, with some drifting and upraising.

Impecuniosity has been the chief ailment of the Spitzee Company, and it is thought that the Le Roi Company can make a valuable property of this nascent mine with a small financial outlay to begin with. The Spitzee group includes the Spitzee Fr., Fool Hen, Darby, and



Le Roi Headworks and Hoisting Plant on hill in foreground. Power and Air Compressing Plant in foreground. Note Le Roi, No. 2, Properties and War Eagle Headworks in background.

Nelson No. 2, comprising about 110 acres. The properties controlled by Le Roi Company proper embrace Le Roi Claim, Le Roi Fraction, Black Bear, etc., containing approximately 100 acres, or 210 acres in all, if they take up the Spitzee bond. The Spitzee holdings include the surface rights of some of the claims, much of which is valuable city property.

In the company's report for the year ended June 30th, 1906, dated November 27th, 1906, it is shown that the balance in favor of profit and loss account at the end of the fiscal year was £37,138 7s. 10d. on the operations of the company for the year, which added to £150,539 1s. 10d. from last year totals £187,677 9s. 8d. Out of this an interim dividend of one shilling and sixpence was paid on the 28th February, 1906, absorbing the sum of £15,750. The directors recommended a final distribution of 2s. per share, less income tax, making 3 1-2 per cent. for the year and leaving the sum of £150,927 9s. 8d. carried forward. This was the first Le Roi dividend since 1899.

The above profit of £37,138 7s. 10d. was arrived at after writing off £28,628 10s. 5d. in respect of exploration and development; £18,163 19s. depreciation on machinery, plant, surface improvements, etc., at the mine and smelter; £3,727 10d. for special expense in connection with amalgamation scheme; paying £3,464 4s. 2d. to the British Columbia Government in full settlement of their claim in connection with revision of taxes, covering period July 1st, 1900, to October 17th, 1905; and deducting other sundry items of expense amounting to £6,315 1s. 10d.

The liabilities, June 30th, 1906, were £15,282 7s.; liquid assets, £126,966 10s. 7d., showing a surplus of liquid assets over liabilities of £111,684 3s. 7d. Cash on hand at London and Rossland at that date was £90,-097 1s. 7d.

On August 30th, 1905, the directors removed Mr. McMillan, managing director, at present writing, from the board, and entered into a contract with the Trail smelter to treat the output of the mine, asserting that a saving would be affected. But it would seem that this was not the case, and at the time of writing the Northport smelter is treating the entire output of the mine, the contract with the Trail smelter having been settled and cancelled.

The cost of ore production, 1906, was $2.84; exploration and development written off, $1.26; depreciation on

mine account, 36 cents; smelter and realization charges (direct and indirect, including first depreciation, interest, etc.), $6.04; total, $10.50.

During the year 110,042 dry tons of ore was shipped, valued at $12.37 per ton, to Northport and Trail; 26,850 tons were smelted at Northport, and 83,192 at Trail. It cost the company $312,615.29 to load this on the cars, equal to $2.84, and $1.25, as per above table. It will be noted that good management and strict economy are required to make the Le Roi mine pay, as the margin is so narrow between cost and realizing figures.

Ore smelted at Northport was 36,851 dry tons; matte and "clean-up" shipped was 1,489 tons, of a net value of $505,002.13, equal to $337.10 per ton.

Le Roi averaged:—Gold, per ton, .39 ounces; silver, .54; copper, 1.16 per cent.; average value, $12.37. There were 7,180 feet of development work done during the year, the cost of which was $127,616.38.

The cost per foot of upraising was $33.75; winzing, $45.85; crosscutting, $16.18; drifting, $15.76; diamond drilling, $2.88.

The rock in Rossland camp is of a very hard and tough quality, and development work is costly. The above figures will give a very fair estimate of what the mines of this camp have to contend with. It would be almost impossible to mine here if the ore was not generally found in very large bodies.

As is generally known, Le Roi lead was discovered in July, 1890, by the two prospectors who located the Centre Star, War Eagle, Virginia and Idaho claims. They gave Le Roi claim to E. S. Topping, then of Trail, B.C., six miles from here on the Columbia River, and at that time the gateway to this camp, for having the five claims recorded, which cost him $12.50. The first samples taken ran $38 to $40 per ton in gold alone. In November of the same year Topping bonded the claims to a syndicate of Spokane people, receiving $16,000 in cash as a first payment. The Spokane men, subsequently acquiring the property from Topping, worked the mine until 1895, when it again changed hands. It paid for its own equipment and development from the grass roots. In 1896 the first dividend from the products of the mine was paid, amounting to $25,000, and further dividends, which aggregated $825,000, were paid up to the time the British American Corporation, of which Whittaker Wright was one of the promoters, took the property over. This corporation in 1898 paid about $6 per share for the majority of the stock, or equivalent to $3,000,000 approximately for the property; the minority interest was afterwards purchased for about $8 per share, hence they paid in all about $3,750,000 for the mine. Some of those who sold their stock at $6 and $8 had bought it as low as 10 cents per share, the rapid advance having been made by the discovery of prodigious bodies of ore in what is known as the Black Bear Tunnel, where the ore, which was only an ordinary showing on the surface, had widened out like an inverted funnel.

After the acquisition by exotic interests the mine produced another $250,000 in dividends. This, with the dividends declared in 1906, would make a grand total of approximately $1,245,000. This over and above a large expenditure for the very complete and up-to-date mining, hoisting, power and smelting equipment at Rossland and Northport.

The different members of the present management, and more especially the managing director, superintendent and business manager, are all votaries at the shrine of higher mining practice, and will no doubt in due time steer the good craft Le Roi into the harbor of affluence, which is a consummation earnestly looked forward to by all those interested in the company, directly and indirectly, both in this district and abroad.

HOW LONDON VIEWS COBALT

Two years ago London casually considered Cobalt. That is, London superiorily accepted the haphazard statement, varied here and there by authentic data, that phenomenal argentiferous rocks had been definitely located in Northern Ontario—about which the average man in the city knows as much as he does about geological horizons. Reputable commissioners came here with something to sell, or something requiring research work in the laboratory; newspapers gave a little space to statements of values based on actual shipments; speculators were incredulous; technical men were curious if cautious; but London remained aloof because it prefers the yellow to the white metal. There is a glamour about gold that appeals to Throgmorton , Threadneedle and Lombard Streets, consequently Siberia, Korea, Rhodesia and the contact rocks in the vicinity of the mountains of the moon were given precedence to Cobalt's complex silver ores. It required considerable persuasion to establish the excellencies of the Cobalt country, silver contents exceeding Virginia City and Leadville records from surface development being sagely regarded as enrichments at outcrop likely to prove impoverishments at depth. Probably London technical experts are no exceptions in fortifying themselves behind "insufficient work." They reserved what judgment they had, at any rate, and their precaution was the more hastily exercised owing as much to metallurgical intricacies as to the indisposition of mining financiers to enter an untried field.

London is so constituted it will not confess error. Nevertheless, its inability to be sensible about mining in general is proverbial. If assured that Cobalt is less ephemeral than hopes as to Rhodesian banket, Witwatersrand revivals, Siberian lodes and Korean occurrences are known to have been, the section served by the Temiskaming & Northern Ontario Railway would be less askant to its glances. Leading Siberian promoters are luxuriating at fashionable hostels or are nursing their impaired balances, while the participating portion of the public would forget the experience if possible. Rhodesia's fiasco is now measured by a maximum of loss and minimum chance of recovery. Korea has its own troubles. The underwriting of public issues is something about which monied men are chary. London has the worst attack of "funks" the habitues of the "Devil's Kitchen"—in Bartholomew Lane, opposite the Bank of England—recall. The guaranteed South Manchurian loan, underwritten in sixty minutes, is thirty-five shillings below the issuing price the day following the closing of the lists. Witwatersrand—"Kaffirs"—shares are in the dumps. You would naturally suppose Cobalt would be taken seriously, though carefully; yet such is not the fact. Somehow there is a suspicion that the permanency of Ontario's infant prodigy—its longevity, rather—is too problematical to permit of the purchase of dollar shares at 25 or 50 cents, or of areas vouched for somewhat in this fashion:

> "The favourable geological formation, large area and situation, make this property undoubtedly of great prospective value, and I am of opinion that *when it is prospected and developed important discoveries* will be made."

It is all very well, and it may be comforting, to learn that $1,000,000 will demonstrate the truth or falsity of the "opinion" herein expressed. There was a time in the "Woolly" West when it was painfully in evidence that "foxes have holes" in the ground, and that the venturesome "tenderfoot" had holes put in his purse when he went afield. Hundreds of millions have been stakes at the Witwatersrand upon bore-hole results, but all that is at an end, and Toronto's fields will not be supported upon such conjectures, or the "logic" of an F. G. S. and M. I. M. M. of London, who in this same connection writes:

> "The *geological trend* of the lake (sic) is in a north-east and south-west direction, and is such that it cross-cuts the run on the east and west veins of the district for a distance of one mile, *and any* continuation of these veins from the adjoining properties will run into this company's property. For instance, the ..... vein of the ..... Company has a magnetic bearing that *must bring any* continuation of that vein into this property."

Another expert puts it that these "veins on adjoining territory, especially the ....., have a course which would indicate, *if they continued*, they would enter ..... Lake, but as the entire ground is under water, this cannot be ascertained until the lakes are drained."

A Lieut.-Colonel, Bank Manager, Provincial Minister, Lieut.-General and a Baronet have subscribed to the prospectus of this company in embryo. They solemnly incorporate in their request for a million dollars on this description of a body of water, "geologically" almost at right angles with the "strike" of veins as disclosed in an adjoining property, which veins may be "discovered" under the lake when the "prospective value" has been established by prospecting and development!

Amrican speculators profited by disposing of cheap acres afterwards ascertained to be under water, or swamp land. The gullible and overcredulous are domiciled universally. London, however, having a spasm of worldly wisdom, will not go diving and have promoters pump such air to its capitalists. Besides, there is greater need for facts as to silver contents at depths, away from lakes, before submarine mining is attempted. That this is pressingly so, I submit the following extract from the *Daily Mail*, appearing in to-day's issue:

[The danger is that Cobalt may "pinch out," as other silver fields like it have done in the past. There is so much precious ore right on the surface that there are places where you can rub your boot on the rock and see it shine like a bright new silver sixpence. But most geologists believe that the rich values lie only near the surface and will soon be exhausted. However, geologists, like other people, are as often wrong as right, and at present the man who should express a doubt on the spot as to Cobalt being a deep-level proposition would be well advised to leave camp by the next train. The camp speaks with lowered voice of truck loads which fetched their owners ten thousand, fifteen thousand, twenty thousand pounds. That three mines alone have made already £4,000,000 between them is an authentic fact. It is nothing out of the way for the ore to yield 75 per cent. of silver, and there are by-products too.

The pitiful part of it is that the small investor should be so fleeced. It may be the richest silver mine field in the world, but if it were capable of yielding a quarter of what the wild-cat prospectuses have promised, it would have to be four times richer than even the optimists believe it to be. Already more money has been lost over worthless properties than has been made out of paying mines. A mania seized the Canadian public. The newspapers were filled with alluring baits for the get-rich-quicks, who swallowed them with fatuous avidity. Now they are beginning to see what fools they were. Even if the production for 1907 totals up to £2,000,000, the figure predicted by the most hopeful, I have the authority of Mr. Nicholas, of the Canadian Geological Survey, for saying that this will not serve to pay a reasonable dividend on more than half the capital invested. And it was not "a reasonable dividend" which prospectuses promised—it was anything from 15 to 25 per cent.]

Of course the writer of the foregoing has mingled apprehension with optimsim. The mining camp that returned dividends on *all* the money represented in prospectuses and promotions has yet to exist. Nor is it within the province of the Dominion Geologist to venture into high finance. At the same time, the case as presented, and as emphasized by excerpts from the prospectus quoted, suggests the necessity for a stricter sense of responsibility among those with most at stake in the Ontario mining fields. London has more scrip than it can digest. It is not inimical to Cobalt propositions. That it allowed Americans to obtain excellent Cobalt properties, it fully comprehends with regret. It was receptive toward Cobalt until recent fiascos reaffirmed the futility of buying reams of paper at 10 or 20 per cent. of its face value upon reports and estimates framed so recklessly. Undoubtedly Canadian mining districts could be made the basis of healthy speculation and exploitation, and The Canadian Mining Journal, it is anticipated, will contribute largely to that end. Mining company and syndicate regulations will not remedy the laxities. The very latitude essential in new districts makes it incumbent upon the technical and daily press to safeguard the meritorious and placard the unworthy.

ALEX. GRAY.

(Late Editor South African Mines, Commerce and Industries, Johannesburg.)

A "Foster" Specimen

Specimen from the Foster mine, in the southeast part of the north half of lot 4, concession 4, in the Township of Coleman, district of Nipissing, Ontario. Brought in by Mr. A. P. Low, July 30th, 1907. The dark steel-gray, lustrous mineral is stromeyrite, the normal composition of which as deduced by Dana is: Sulphur 15.8 per cent., silver 53.1 per cent, copper 31.1 per cent; this is the second occurrence of this mineral reported from Canada, the other being at the Silver King mine, Toad Mountain, West Kootenay, B.C. (Ann. Rep. G. S. C. vol. viii. 1895, pp. 12 and 13 R). The bronze-yellow mineral is argyropyrite, a sulphide of somewhat uncertain composition, commonly holding 25 to 30 per cent. of silver and 35 to 40 per cent. of iron, often with adventitious copper. With the stromeyrite and argyropyrite in this specimen there is also associated some native silver, the gangue being a grayish-white quartz.

Mr. Smith Curtis, in an interview with *The Rossland Miner*, last week, expressed a very favorable opinion of copper mining prospects in the Kamloops district, from which he had recently returned. Only one mine, however, is being worked at present, but good ore was being taken from this property, which had been developed to a depth of 600 feet.

A. P. LOW, DIRECTOR OF THE GEOLOGICAL SURVEY

By the Editor of the Geological Survey.

If one were to accept the views advocated by certain Canadian papers not at present enjoying the patronage of the Government, one would be disposed to believe that all positions in the Civil Service are filled by "pull," and that the recipients of such promotion have one common end in view—graft.

The Department of the Geological Survey—now officially designated the Department of Mines—has happily been practically free from political patronage, and the Minister, the nominal head of the Department, has honestly endeavoured to appoint as Director that man best fitted to fill the position.

Fortunately for the Survey, there have been few opportunities for the Minister to exercise his discretion. Logan created the Canadian Survey and raised it to a standard difficult for even such men as Selwyn and Dawson to maintain. After Dawson's death the Government determined that future Directors of the Canadian Geological Survey should themselves be Canadians. The time had gone by when we needed to send to England or Australia to find a competent Director. Scientists, Canada could supply in plenty, and scientists who, by reason of their special knowledge of Canadian conditions, were more fitted for the position than any stranger could possibly be. But a scientist—especially in these days when scientists adopt specialties—is not necessarily an administrator; indeed, it is more often the case that a scientist cannot administrate at all. When it is taken into consideration that the Director of the Survey is expected to successfully control fifty or sixty men, each of whom believes that his own brand of science ranks higher in importance than any other; and that one of the Director's principal duties is to so apportion their work over this huge Dominion as to extract the greatest benefit, both scientific and economic, while not clashing with the work being accomplished by the Provincial Surveys, it can be readily understood that a first-class Director must be not only a first-class scientist, but, above all, an able administrator.

Those who read Mr. Low's reports on his researches in Labrador or his voyage in the Neptune, were prepared to hear of his appointment to the Directorship. No one who has read these reports can fail to appreciate that Mr. Low has the two requisites that combine to make an able Director—a thorough knowledge of geology and a fine power of administration.

Mr. Low was born in Montreal on May 24th, 1861, and is believed to have succeeded in getting into more scrapes, as a youngster, than would make a good record for any two average Canadian school boys—which is a sufficiently large order. He was educated at the public schools and soon evinced so decided a taste for applied science that he was allowed to make it his specialty. He entered the Applied Science Faculty of McGill in 1878 and passed with first rank honours in Natural Science in 1882.

With his inborn love of knowledge was interwoven—as is so frequently the case—an inborn love of sports. Many of the Director's staunchest friends to-day were his friends or foes of the football field and hockey rink of many years ago. Indeed, hockey was not played at all in Ottawa until introduced by Mr. Low, and some of the most strenuous football matches ever witnessed in that town were won and lost by the Ottawa Football Club, which Mr. Low captained for many years.

In 1881 Mr. Low was appointed as a "student assistant" to an exploration party sent by the Geological Survey to the Gaspé peninsula, and from that time to the present day his work may be followed in the Survey's reports. His work—but not his life—for it has ever been an unwritten law with the Survey officers that as little as possible should be made of difficulties overcome or danger averted. In this respect Mr. Low has followed the Survey traditions with almost irritating fidelity, and only those who know the conditions of northern travel can read between the lines or suspect, from perusing Mr. Low's geological reports, what risks have been run, or what suffering has been endured. His reports, like poets,



A. P. LOW.
Deputy Minister of Mines and Director of the Geological Survey of Canada

" . . . lose half the praise they should have got,
Could it be known what they discreetly blot."

A "student assistant" on his first expedition is very carefully watched; the Survey is always on the look-out for new material. Good field geologists are scarce, for the first essential in a budding field officer is observation, and the power of observation in this age of cram is becoming, as is well known, rarer and more rare. But in this Dominion, mostly unsurveyed—except in a very superficial manner—the field geologist is practically use-

less unless he combine with his knowledge and faculty for observation a splendid constitution, large powers of endurance and a spirit of determination that, when it fails, is called pig-headed obstinacy, or, when it succeeds, unswerving persistency.

That in Mr. Low these unusual factors were combined became apparent during his first field work in Gaspé, and, on the recommendation of Dr. Ells, who was in charge of the party, he was offered and accepted a permanent position on the Survey staff.

From that time it has always been recognized that Mr. Low was in the running for the Directorship, and it was pretty generally known that to be Director became, in after years, his chief ambition. So well was this recognized that, one Christmas, some wag on the staff brought out a Christmas card containing "quotations" for the Geological Survey, and apportioned the following lines to "A. P."

"Low was his name, but great was his desire."

—*Shakespeare.*

The hit was a fair one, though it was rather unkind to ascribe the lines to our national poet, who never perpetrated anything like them.

In 1884 an expedition was sent by the Quebec Government and the Geological Survey to make a report on the Mistassini district, and especially to survey those portions of Mistassini Lake that had been left uncompleted by McEwart and Richardson. A Quebec land surveyor was in charge of the party, to which Mr. Low was attached as a geologist. The methods employed by the expedition were not such as would recommend themselves to any officer of the Geological Survey, to whom "hustle" becomes the first essential directly the flight of winter makes field-work possible. Kicking his heels in Quebec, waiting for the expedition to move, was not Mr. Low's ideal of geological research, and he started on his own account up the Bersimis River, supposing that the main party—unhampered by field-work—would soon overtake him.

He reached Lake Pipmuakin, but no main party appeared and he was compelled to return for food. Delay after delay occurred, and it was actually not until late August that the expedition at last got away. The natural consequences ensued. Blizzards caused frozen faces, frozen hands, frozen feet; food ran short, and the game that had been counted on failed to appear. The party lived for some time on starvation rations, eked out with an occasional beaver, but for which the entire expedition would have suffered the same fate as befell the unfortunate Indians last month, whose skeleton bodies lined the same route, and whose fate was made known by one of the survivors, John Bastian, who acted as Mr. Low's guide on three trips in Labrador.

The exhausted expedition eventually reached the Hudson Bay Company's post on Mistassini Lake, where they arranged to winter. From Mr. Low's point of view, everything had been disappointment. Nearly a year gone by and practically nothing done. There was, however, time to think—weeks of leisure—and Mr. Low employed it in coming to a noteworthy decision. He left the post in February, arrived in Ottawa the first of March, and interviewed Dr. Selwyn, the Director. What passed is known only to Dr. Selwyn, Mr. Low and the Minister, but in a few days Mr. Low—with J. M. Macoun as assistant—set out once more for Lake Mistassini, armed with a letter giving him complete charge of the entire expedition. But it was more by good luck than good management that these two officers ever reached the lake. Untaught by previous experience, they counted on making the average number of miles per day and on living largely on the country. Soft weather made travelling terribly slow, the game perversely refused to be accommodating, even the beavers kept away—and the two white men, with six Indians, found themselves half starved and fearfully weak at Lake Chibougamau, sixty miles from the nearest post.

It became evident that for the whole party to make a forced march meant death to some of them, and Mr. Low called for a couple of volunteers to hurry to the post with news of their plight. At the same time it was arranged that the party should move as quickly as possible along the trail, in the endeavour to save a few hours. The volunteers accomplished their mission admirably, but the starving party missed the trtil when they had followed it for some twenty miles, and were obliged to camp, in view of the danger of missing the rescuers with food. Mr. Low describes the first twenty-four hours of absolute starvation as very painful, but adds, strangely enough, that during the subsequent four days he and the men suffered very little. What was worse than the starvation was the anxiety as to whether the volunteers would be able to reach the post. On the fifth day, food, supplied by the H. B. Co., arrived. It was only flour and lard, but to the starving men it was beefsteak and onions. They made a meal that Mr. Low describes in the words of the poet Young as "an elegant sufficiency," and immediately afterwards started for Lake Wakonichi, but soon encountered more food—bacon this time—sent from the same source—and encompassed another meal, whose proportions did not seem in the least handicapped by the previous Gargantuan repast.

Crossing Lake Wakonichi the party met with its first piece of good luck. In a net set by some trapper they found a lake trout weighing nearly twenty pounds, and it can be imagined what a meal this made, cooked with flour and bacon.

Early in May the Mistassini post was reached, and Mr. Low took over charge, the first of the many that have been entrusted to him, from which time he has been regarded as the standard authority on the geology of that huge tract commonly known as the Labrador peninsula.

Of his observations and experiences in the Mistassini district Mr. Low could fill a goodly sized book and still leave much untold. In the space of this short sketch it is impossible to do more than allude to the incidents of his travels, but one fact regarding Lake Mistassini it is difficult to refrain from mentioning. On the 24th May, an Indian attached to Cleary's trading camp, left the post and crossed the lake on his heavily-laden sled. At noon Low and Macoun were paddling ice blocks in the lake, and in the afternoon A. P. celebrated his birthday by enjoying quite a long swim. The temperature was 84 degrees in the shade, and proved to be the highest recorded that summer.

The survey of the lake was completed in July, after which the party surveyed the Rupert River to Rupert House, journeyed to Moose Factory, ascended the Moose River, and eventually reached Missinabie, where the Canadian Pacific Railway was in course of construction.

In 1886 Mr. Low was instructed to find the outlet of Favourable Lake, in Keewatin, to survey the Severn River, and to return via Oxford Lake and Norway House. Prof. Macoun's son was again appointed as assistant, and together they journeyed up the Berens River from Lake Winnipeg. They found the outlet of Favourable Lake, though, if the truth must be told, they found it by accident—and followed it to Severn Lake. The season was exceptionally dry; no rain fell for six weeks,

forest fires obscured the atmosphere, taking sights became difficult, and sometimes impossible, and the travellers once more found themselves on starvation rations. For 300 miles no human being was met nor any game near enough to be shot. At last an Indian and his squaw were sighted in a canoe trying to escape notice. When called upon they endeavoured to outdistance the party, and a long chase ensued, ending, after ten miles hard paddling, in the couple being caught. They had no food to spare—scarcely sufficient indeed, to take them to Trout Lake, the nearest H. B. C. post. They were, however, induced to act as guides, and, with their help, the party arrived at Trout Lake before the want of nourishment had caused any serious harm. The Hudson Bay agent was only able to supply them with fish pemmican, which, for the uninitiated, it may be explained consists of boiled fish, dried and pounded, stored in birch-bark baskets, with, generally, a rabbit-skin holding fish oil in which to cook the appetizing concoction. Furnished with what, after their privations, seemed to be luxury, the party continued down the Severn River, but in a reach of the stream what they thought was a rapid turned out to be a fall eight feet high, and trouble ensued. The first canoe actually rode the crest and fell into the river below without upsetting or sustaining any harm. It, however, displaced some loose rocks just before taking the plunge, and the second canoe, striking these, never had a fair chance. The canoe was so badly damaged that only with great difficulty did the party succeed in nursing it to Fort Severn, but the precious pemmican was unharmed, and in comparison to that, the rest mattered little.

At Fort Severn unsuccessful efforts were made to obtain another canoe. It was decided to repair the boat as much as was feasible, and coast westward to York Factory. During this westward trip, camp was pitched at night on the dreary mud flats that characterize this portion of Hudson Bay. On the second night a storm arose that played havoc, not only with Mr. Low's tent, but with his intentions. The wind picked up one of the canoes—they had been staked down as usual—blew it across the tent, which it tore down, and damaged both tent and boat beyond repair. Macoun returned to Fort Severn with instructions to procure a boat of some sort —honestly if he could, but to procure a boat. Here again good luck intervened, for, after some days, Macoun was sighted with four Indians in a flat-bottomed boat lent by the H. B. C. The boat had been made at Fort Churchill, had drifted away and had turned up at Severn post just in time to loan to Macoun.

Though the boat made good way before a fair wind, tacking with her was a tedious business, so much so indeed that when Mr. Low shot a polar bear he was unable to capture the prize owing to the difficulty of beating against the wind. Game, however, was plentiful. Ducks, geese and caribou were easily obtained, so that the loss of the bear was not a serious matter.

York Factory was safely reached, and a river boat was obtained. Mr. Low reached Norway House just as W. H. Gilder and his party were setting out on their search for the North Pole.

From 1887 to 1891 Mr. Low continued to add to our knowledge of Canadian geology. At first in James Bay and afterwards in the country north of the St. Lawrence he made extensive surveys, the results of which, are they not written in the chronicles of the Geological Survey?

In 1892 it was determined to map the new northern boundary of the Province of Quebec. It seemed taken as granted that the officer in charge would be Mr. Low, and Mr. Low was duly appointed. He travelled north from Lake St. John to Mistassini, crossed from the Rupert River to the Eastmain River, and made the first instrumental survey on record of the western portion of that large stream. In the following year he travelled by the same route to the Eastmain River, which he surveyed to its head. Afterwards he began a series of geological explorations in Ungava, the results of which are embodied in a report officially known as Part L, Volume VIII. This publication has remained ever since, and seems likely to remain for some time, the standard geological work on the Labrador peninsula.

The party portaged to the head waters of Big River, and down it to Lake Nichikun. Thence a traverse was made to Kaniapiskau Lake; the Kaniapiskau River was followed, and subsequently the Larch and Koksoak Rivers, to Chimo on the coast.

No fuss was made about this journey, no bombast displayed, no magazines published illustrated articles with lurid head-lines. Had Mr. Low or his assistant (Captain —now Major—Eaton) died from privation, the newspaper reporters would have craved for copy and fought for photos, but as the exploring party happened to be in charge of an officer who understood the conditions, realized the difficulties, who went prepared for emergency and was fortified with experience, no lives were lost, no pathetic diaries were written, and the newspapers were too wise to fill their columns with dry geological details.

Mr. Low had intended wintering at Chimo, but a severe famine—to which nearly one hundred natives succumbed —induced him to alter his plans, and the party were conveyed by the H. B. Co.'s steamer to Rigolet. In the following March the survey of the Hamilton River was commenced. Twelve extra natives had been engaged, and each man—white and native—drew 200 pounds on a sled. Progress was necessarily slow, but after some days the spot to which canoes had been sent was reached, and the extra men were sent home. Though the Grand Falls are not the largest or the most powerful in the world, they run the Victoria Nyanza a close second, and, compared to them, Niagara is but a baby waterfall. Mr. Low first saw this magnificent accident of Nature from a cliff nearly 500 feet high. He had been warned of the irresistible desire the spectator feels to throw himself into the gorge, and had laughed. He describes his feelings, however, not as if he had any desire to throw himself over the cliff, but as if someone behind was pushing him, and, as happens to all who view this extraordinary sight, it was with difficulty he was prevented from precipitating himself into the gorge, under the belief that he was being violently shoved. The water has a sheer drop of 312 feet, but the total fall of the river here is over 700 feet, and it is estimated to give nine million horsepower. Mr. Low has pointed out the vast possibilities of this neglected power, which, there is little doubt, will some day supply the greater part of the Province of Quebec.

It was after having mapped the head waters of Hamilton River that Mr. Low reported large quantities of excellent iron ore along the valley of the Ashuanipi River and deposits of labradorite in Lake Nichikum. Labradorite is probably the most perfect and certainly the most beautiful building stone of which we have any knowledge, and in the days to come, when the valley of the Hamilton River is being worked for iron, this wonderfully streaked feldspar will be quarried in enormous quantities.

The expedition returned by way of the Romaine and St. John Rivers, having accomplished what was probably

the most interesting survey ever made by the Canadian or any other Government.

By this time Mr. Low had come to be recognized as the right man in the right place—the right place being Labrador—and he spent most of the following five years in mapping the least known portions of Ungava. As a welcome break in these desolate surveys he was sent in 1900 to the Paris Exhibition to superintend the Canadian mineral exhibit.

The continual mention in the Geological Survey reports of first-class magnetite and hematite in Labrador and on the islands of Hudson Bay had attracted the attention of American capitalists, and on Mr. Low's return from Paris he was approached by a Philadelphian Syndicate who endeavoured to procure his services in prospecting the Nastapoka Islands. Many years ago that sage observer, Hudibras, referred to

" . . . the evils that do environ
The man that meddles with cold iron."

In this case the evils were complicated, for difficult as it is to join the Geological Survey, it is almost impossible, once you play the prodigal, to be again embraced by those stony arms.

Mr. Low, however, took chances and made a detailed report on the iron deposits—he located 8,000 acres—of the Nastapoka Islands. His report has never been made public, but it is understood that though the ore was both plentiful and of first-class quality, he considered the economic conditions too unfavourable for profitable mining. Nothing, perhaps, is more to Mr. Low's credit than the fact that the Geological Survey jumped at his offer to rejoin the service, and he was immediately marked as one of the few possible candidates that could be put in charge of the expedition the Government intended to despatch to the Polar regions. Eventually Mr. Low received his commission as commander of the "Neptune," and his report of the work performed by the expedition has become an Arctic classic.

It was in connection with that report that the present chronicler first met Mr. Low, and thereby hangs a tale so good that, though Rome fall, it must be told.

Mr. Low had made certain statements which the writer in his capacity as editor—and after having consulted the Encyclopedia Britannica—queried and altered. The Arctic explorer, exceedingly wroth, interviewed the editor and told him that he might alter the expression as much as he d—— pleased, but he must not alter the facts. "Anyway," said the irate geologist, "where did you get your information?" The editor meekly explained. "Oh, great heavens!" said Mr. Low, "why go to the Encyclopedia, why not consult a specialist?" The editor brooded over this melancholy incident for some days and then wrote the editor of the "Times," asking why the information was not up-to-date. He received a letter to the effect that though the "Times" was not responsible for every sentence written, it endeavoured to ensure accuracy by inducing specialists to write, and, in this case the article was supplied by the well-known Labrador explorer, Mr. A. P. Low.

The report of the voyage of the Neptune, Blue Book though it was, differed so materially in style and manner from most other Blue Books that the Government decided to publish it in an *edition de luxe*. Seven thousand copies were issued, but the demand was so great that before the wholesale booksellers could be supplied the entire edition had run out.

Among the many conclusions arrived at in the "Voyage of the Neptune" the following are probably the most important, and the reasons that led to their adoption are very forcibly argued by the author:

1. The discovery of the North Pole, except as a matter of sentiment, is absolutely useless.

2. With plenty of good luck, the North-West passage can be made, but will never be a commercial route.

3. The Hudson Bay route for wheat to Europe is not only practicable, but is bound to be adopted in the near future.

4. Unless the Government take strong measures, the Eskimos are a doomed race.

In 1905 the Quebec Government requested the Dominion Government to instruct the Geological Survey to make a report upon the mineral areas in the Lake Chibougamau district. Accompanying the request was a rider to the effect that of all the field officers in the survey, Mr. Low would be the most acceptable. Mr. Low, accordingly, was sent. His report could scarcely be considered a very comforting document for those deeply interested in Chibougamau mining, but the author expressed the opinion that further prospecting and cheaper transport may develop something really profitable in copper and asbestos.

In April, 1906, Mr. Low was appointed Director of the Survey, and immediately started on a stretch of hard work that came near to being his undoing, both physically and mentally. Late hours at the office and an attack of "grip" were the cause of the evil, and in January last Mr. Low was reported dying. But the constitution of a giant and the pluck that had pulled him through so many narrow escapes came to his rescue and after a month's anxious waiting the Survey heaved one big sigh of relief when the daily bulletin read "out of danger."

The illness has left its mark. The remarkably youthful appearance that characterized the Director is no longer seen—

" . . . . . . middle age
Has slightly pressed its signet sage."

But, fortunately, this is all. The clearness of thought is still there, the ability to decide quickly what line to take, and the determination to take it and stick to it are still there; above all, he still retains the friendship and respect of the staff—who, as one of them remarked the other day—would "work their fingers to the bone to do old Low a turn."

"THE TRUTH ABOUT WABANA"

Shipped, in good order and condition, in and upon the good ship Sommerstad, now lying in the port of North Sydney, whereof Ellefsen is master for the present voyage, and bound for Wabana, the parcels, marked as in the margin, "(*a*) Perishable, handle with care; (*b*) irascible, handle gingerly, to avoid explosion." Bills lading, in general, do not make provision for details, so it may here be explained that the so-called "parcels" were "valuable," inasmuch as they consisted of the writer and his better half. Contrary to accepted, if not strictly correct rule, the first named, in the present case, will do all the talking.

Wabana, made famous by its iron ore, is the chief port of Bell Island, an island in Conception Bay, which in its turn is in Newfoundland. Wabana is in N. lat. 47′ 37, and W. long. 53′ 56. It is distant from Sydney harbor about 400 miles; from Halifax, about a hundred more,

and from St. John's, Newfoundland, a very short distance. Leaving Sydney harbor, the course is straight south for Cape Race, then along the coast, past St. John, and then turning a corner, at Cape St. Francis, Bell Island, is visible; that is, when there is no fog, which I believe is seldom. This description as to the whereabouts of the famous isles should be comprehensive enough to satisfy the ordinary reader; the extraordinary may obtain fuller particulars in an admiralty chart.

I had heard some fearsome stories as to the difficulties attending a landing on the island—not on the pier, which can be reached by a land ladder—and so, as I had come with the intention of seeing the ore mines, I had made up my mind to "play the game," no matter how many or how great the obstacles. Pshaw! It was dead easy. I had been told people were taken up in a basket on the sides of precipitous cliffs. The cliffs were there all right, but the basket was absent. Instead there was a platform, as in an elevator, only more original in design. If in an elevator an ascensionist happens to be a giddy person, he cannot well fall out, walls and bars prevent him. The platform at Wabana, not being ornamental, has on its sides two iron rails, while its ends are open. The ascent is easy and pleasant; the descent, as one sees the abyss below, may not be so cheerful. We went up on the elevator and down by the stairs—for there are these as well as the elevator, and by the time the bottom was reached one of the party was wet with sweat.

Of Bell Island it cannot be said that it is a lonely island. Before the Nova Scotia Steel & Coal Co. set foot there it was a well populated and a well cultivated island. There were some five hundred families on the island making a living by fishing and farming when the Nova Scotia Steel & Coal Co. set about the development of the island's iron ore. The population now is probably 3,500 to 4,000, as in addition to the original inhabitants there are employed in connection with the mines some 1,400 or 1,500 persons.

There are two popular impressions in regard to Bell Island which are erronous. The first, that it is a much out of the way place, and the second, that the whole island is a mass of iron ore. With regard to the first-named, it may be stated that, when good connections can be made, St. Johns can be reached in two hours. The distance is, say, thirteen miles, four by water to the mainland and nine by coach to the capital. As to the second wrong impression, Bell Island has less than a fifth of its surface laid or underlaid with ore. I use the two words advisedly, as one of the beds lies chiefly on the surface; the other underlies it some two hundred and thirty or forty feet. The island is, say, eight miles long by two wide, while the iron ore covers an area of three and a quarter square miles. As yet, if hopes do not fail, and if prospects are not foiled, the quantity of ore in these three odd square miles will form a small proportion only of the ore which will find an exit by way of the island, for, while both the steel companies may have between them thirty to forty million tons of ore available on the land areas, it is hoped that that is only a bagatelle in comparison with the quantity in the submarine areas.

Before leaving Nova Scotia, one indirectly interested in the Torbrook, or Nictaux, iron mines, said: "See now that you write a good article and head it, 'The Truth About Wabana.'" Well, that's what I "lay out" to do, without entering into bonds as to the goodness of the article.

There are the principal seams of ore, marked the upper and the lower bed. The upper bed is the one so much has been heard about, owing to the facility with which the ore was mined, as it lay largely on the surface, or with a slight covering of earth only, removable at some points by hand, at others by a steam shovel. Though a large quantity of the surface ore has been removed, much yet remains. Both companies, however, are developing to the deep by slopes, preparing for the future. The thickness of the beds is, say, nine feet, divided into two layers. The under layer of at least one of the seams is not quite so high in iron as the other. On the land areas of the Nova Scotia Steel & Coal Co. it is estimated there are twenty millions of tons. To be safe, let me say fifteen millions. But, as said, it is hoped that is only a patch in proportian to what is in the submarine areas. The outcrops of the seams run east and west, and the pitch is northerly. The angle or the dip of the seams is about eight, or say a foot in twelve or thirteen. To the north, between the island and the mainland, the distance is eight miles. It is not supposed that the submarine ore areas continue on to the mainland. Indeed, it may be said it is known they do not, but there is no reason why they should not continue under the water for four, five or six miles. It may be asked: "Beyond the fact that the seams pitch seaward, is there ground for the supposition that the ore underlies the water?" There is. Through a portion of the lower seam, owned by the Dominion Iron & Steel Co., the Nova Scotia Steel & Coal Co. are now driving, by mutual agreement between the companies, a slope to determine this point. The present length of the slope is some 1,600 feet through land ore and 1,200 feet through ore submarine. And the beauty of it all is that as the sinking progresses the thickness of the seam increases, and the quality of the ore improves. At the outcrop the ore is six feet in thickness; at the face of the slope the thickness is no less than 15 feet. At the outcrop the ore runs from 49 to 52 per cent. of iron; at the face analysis gives 56 per cent. In answer to a question put to Mr. R. Chambers, the best-known iron ore explorer in the Lower Provinces, and the indefatigable, it may be said enthusiastic, superintendent of operations at Wabana for the Nova Scotia Steel Co., as to whether faults or obstructions had been met in the sinking, the writer was informed that under the sea the seam was as regular as on land, and nothing had been encountered to indicate that the seam might not continue for miles under the water. "In that event," said Mr. Chambers, "we will have to figure the quantity of ore out in the hundreds of millions of tons, instead of the millions merely. Of course," said Mr. Chambers, "having examined the land on the other side, and having noticed a disturbance of the mineral, we do not suppose that the ore carries to the main island, and at just what point it stops short it is for the future to decide; but I am in high hopes that there is ore here for all possible requirements for many generations." I did not ask—my memory slipped me—why it happens that the Nova Scotia Steel Co. were driving the slope through the Dominion Iron & Steel Company's area, but I presume the sufficient reason is that where the former company's upper seam enters the water there is no, or not sufficient cover. This may be apparent from the fact that the cover at the face of the lower seam is not much over 200 feet. Bye and bye there will be sufficient cover to justify tunneling to the upper seam.

Many people imagined that until very recently it was all surface shovelling, and not mining at Wabana, and some, one almost thought gleefully, declared that the companies, from this out, would have to "mine" their ore and pay higher for it. Well, there is still much ore on the surface, but the companies wisely are reserving

it for contingencies, while they are not proceeding to win the ore by way of slopes from the "deep." As to the increased cost of mining, the writer, from observation merely, would come to the conclusion that it is infinitesimal. The cost of pumping will be almost nil, if it will be anything, as water is the scarcest commodity in Wabana. It runs off into the sea. The cost of timber will be trifling, as there will be few levels or old places to keep up. In short, there will be few extra expenses in operating toward the deep, the chief one being haulage, and as the systems employed are modern, the cost is trifling. The ore which cannot be procured by quarrying is mined in much the same manner as coal. There is, of course, no undercutting or shearing; it is blown from the solid. The system of mining is modified board and pillar. The levels and the rooms may run uniformly, the modification consists in the lack of uniformity in the size of the pillars. Some are large and others are small. After the rooms in a section have been worked out, the pillars are drawn and the place abandoned. Numerous small engines are employed underground for haulage purposes. In proportion to the number of men employed, the tonnage produced in an ore mine is much larger than in a coal mine. For instance, the total number of men employed at Wabana by the N. S. S. & C. Co. is 671, and the quantity of ore produced is fourteen hundred tons per day.

At the slope mouth there is much of the machinery to be found at a coal mine—compressors, fan, tubular boilers, etc. All the ore on coming from the mine goes through a crusher. Though about fifty per cent. is in small pieces enough, all goes through, as all has to be picked just as carefully as is coal. The ore from the crusher is discharged on a very wide rubber belt, which carries it up at a surprisingly heavy angle. At it passes up, the ore is cleaned by pickers stationed at the sides. In the winter time the ore is put on bank, at a very small cost. Only one man is employed on the bank—the man who operates the engine which hoists up the boxes containing the ore. Self-dumping boxes are therefore employed. On the property there are two mines, Nos. 1 and 2. Overground there is an excellent system of endless haulage for conveying the ore from the mine to the pocket at the pier. A tramway from each mine runs parallel with the outcrop, the main tramway at a right angle. The boxes are of iron, and their capacity close on two tons. The tramway can readily convey two thousand tons of ore daily to the pocket, of which fourteen hundred tons come from the mine and six hundred from the bank. The engine for operating this haulage is situated at the pier. There is only one pocket, but it is large enough to contain no less a quantity than twenty-four thousand tons of ore. In the construction of this big pocket nature played no secondary part. The floor only is artificial. The sides of the high cliffs form the sides of the pocket; the face is exposed. It is of great height. A door in the floor permits the ore to fall on the conveyor, by which it is carried to the chute at the pier and emptied into the vessel. The stream of ore into a vessel's hold is continuous. In twenty-four hours it would be an easy matter to empty the pocket of its twenty-four thousand tons. But for the delay in shifting the steamer, so that each hatch may come under the chute, a six thousand ton steamer could be loaded in about three hours. Wabana is a magnificent asset of the Nova Scotia Steel Company, and like the other branches of the company's undertakings, is splendidly managed.

R. D.

CORRESPONDENCE

To the Editor THE CANADIAN MINING JOURNAL:

Sir,—I have read the leading article in your issue of Aug. 1st, entitled "Another Suggestion," with astonishment, that THE CANADIAN MINING JOURNAL, which at the special request of its publishers was constituted this spring the official organ of the Canadian Mining Institute should be guilty of insinuations, which are not only largely unwarrantable, but are likely to be injurious to the organization whose interests you are expected to conserve. One would at least suppose that any editor of a publication of standing, in a matter such as this, would be careful to make sure of his ground before making what can only be construed as a criticism of the efficiency of the Institute's officers; while in the case of an "official organ" the neglect in this respect is the more to be wondered at—leaving the question of common courtesy out of the discussion altogether. I have no doubt, sir, that your intentions were excellent; but what an awful bull in a china shop is often the well meaning person! Please, meanwhile, believe that in replying to your article I have no desire nor intention of excusing or denying sins of omission or commission which may be laid at my door. I am perfectly well aware that they are many; and any man having to follow the lead of such a one as the late Secretary, poor B. T. A. Bell, must necessarily appear at a disadvantage. But as a member of this Institute of seven years' standing—very nearly constituting me an old-timer—I do protest against the tone of the two editorial articles, in your issues of July 15th and Aug. 1st, respectively, wherein you to all intents and purposes insinuate that except for its annual meetings the Institute is ineffective and ineffectual. If I were not the Secretary I would go for you without gloves; but the trouble is in defending the Institute against this allegation, I must necessarily appear to be defending myself, for your statement to the contrary notwithstanding, the Secretary is the one responsible official. He is expected to do rather more than just "keep a true and correct record of all the proceedings of the Institute" (not to mention the seal); and the council, composed of busy men, look to him to initiate work and practically carry on the business of the Institute, subject, of course, to their confirmation and approval. So if things don't move it is no one but the Secretary's fault. But aren't they moving, or so very slowly as you would suggest? The best day's work ever done for the mining industry of this country was the establishment of a Federal Department of Mines, for which, I submit, this Institute was chiefly responsible—and that was an affair of national, not mere provincial importance. Then there have been, in the last two years, other deputations to Ottawa in connection with other important questions affecting the welfare of the mining industry; and in each instance the Institute has been fortunate in exerting a useful influence.

You, however, cite as an example of neglect the case of the "Mines Taxation Act in the Ontario Legis-

lature last winter," and remark that "the Government emphasized forcibly the fact that nothing had been heard from the Institute until the bill had been for many months before the House." As a matter of fact, a deputation did interview the Hon. the Minister of Mines, Mr. Cochrane, on the subject of the Bill several weeks before the Annual Meeting, and I believe, too, the Toronto Branch also took action; but knowing that the Bill would not pass the House until after the Annual Meeting, it was deemed best to postpone definite action till then, in order that a protest might come from the Institute as a body. The result was we got an association of representative and disinterested men a better hearing from the Ontario Government than was accorded any other body or deputation representing Boards of Trade or individual interests, and we have Mr. Cochrane's definite assurance that he will introduce an amendment to the Act in 1908, upon a certain understanding with the Institute, and for the carrying out of which condition the Institute has already and is now taking steps.

Now, on the score of membership. It is not the policy of the Institute to go into the by-ways and hedges to secure new members; on the contrary, the standard of membership has been raised. But the growth in this respect in the past two years is distinctly gratifying and all that could be reasonably expected. Thus if you will refer to the "Report of the Council for 1906" you will note that the increase of membership last year was over 20 per cent; and this year I have every reason to expect we shall do just about as well. Not so bad surely for an organization that "without doubt needs revivifying"?

Finally, I submit for your information as the "official organ" of the Institute a few facts of which at present you appear ignorant; although the first is readily ascertainable by reference to the published accounts of the Institute for the past few years. While the by-laws state that the Secretary shall be remunerated at the discretion of the Council, this does not, as you intimate, "render his position insecure and in certain matters weaken his hands," since the salary of the Secretary is definitely fixed at a certain figure, payable monthly, which he is entitled to draw so long as he performs his duties. The provision of the by-law is an admirable one, since it affords the only means by which the actions of the Secretary may be controlled by the Council. The Secretary, moreover, is not restricted, as you would appear to believe, in the matter of travelling expenses; but he travels at the expense of the Institute whenever the occasion warrants. Thus already this year visits have been paid to various mining centres in Nova Scotia, several of those in Ontario, one in the Province of Quebec, while this month the Secretary leaves for Alberta and British Columbia, expecting to be absent six weeks on the Institute's business, including attendance at a Sectional Meeting of the Institute in the West.

I trust, sir, that these explanations will enable you to somewhat modify your views. It might possibly be an advantage if the Secretary were in a position to devote his time exclusively to the work of the Institute, although he can conscientiously say that the interests of this organization are now and always his first thought and care. Meanwhile the Institute is growing in strength and influence; it is developing with the development of the mining industry, and I am sure there are many ways by which THE CANADIAN MINING JOURNAL may aid and stimulate present progress without giving expression to ill-considered and undeserved criticism.

Yours sincerely,

H. MORTIMER LAMB,
Secretary.

Toronto, July 22nd, 1907.

To the Editor THE CANADIAN MINING JOURNAL:

Sir,—As a shareholder in the Cobalt Lake Mining Company I desire to thank you for your vigorous, fearless and outspoken leading editorial on the Cobalt Lake embroglio in your issue of July 1st.

The answer of one of the Directors given in your issue of the 15th is, at any rate to me, entirely unsatisfactory. Whoever the Director is, it is quite apparent he is not willing frankly to take the shareholders and the public into his confidence. The pertinent question is, "What explanation can be given of this extraordinary transaction?"

It seems to me unexplainable why these trustees, such as your Director mentioned, should pay such an enormous sum of money to the Government and not secure a good title to the property, but merely a lawsuit.

When adverse claims to the property were pressed in the court, a member of the Ontario Government stated to the Legislature that the Government had not guaranteed the title of our company to Cobalt Lake. Some explanation of this should be obtained, and also as to why it was necessary to pass a Special Act, which seems to have complicated matters worse than ever.

Can the Director in question truthfully say that shareholders like myself were made aware that one hundred and forty thousand shares were distributed amongst a number of men who did no more for the company than is usual in such cases.

The large amount of money which the stock they received represents demands very important services, and I would like to know what they did for the one hundred and forty thousand shares, and why they should have received stock for nothing, or at thirty cents, when unfortunate investors had to pay eighty-five. The fortunate Directors may well afford to look with complacency and contemplate a profit from the stock obtained at our expense, but the bulk of the investors are, I think, those who, like myself, are mourning without hope of ever getting our money back. I am,

Yours truly,

A SHAREHOLDER.

To the Editor THE CANADIAN MINING JOURNAL:

Dear Sir,—I noticed in your last issue a contribution from E. Percy Brown, S.B., on Nova Scotian gold mines, in which he gives much valuable information and corrects some erroneous ideas. For this I thank him, confirming as they do, my conclusions of several years ago on deep mining in Nova Scotia. I would have been glad had the whole article been devoted to such practical points as the direction and permanence of pay streaks. Though he refers to me in somewhat flattering terms, I feel it my duty to call attention to some references to gold stealing which I consider much exaggerated. He writes, "Miners have assured me that they believe," "I have reason to believe," "I

have been told," etc., thus showing the source and value of the assertions on this subject. The statement that more gold was stolen by the miners than obtained by the owners is without doubt an exaggeration by Mr. Brown's informant, as only by taking the most of their working hours is this possible in even a good mine. And when we think of a stream of water large enough to wash the ore piles in the stopes clean enough to make the gold visible in the candle light, it conjures up visions of immense pumps and mountains of machinery. A moment's thought should convince one that water would run under the ore, and not over it, and a mucker who used his time in washing ore, instead of working, would doubtless find his place vacant ere long. The deckman who sorts the ore in broad daylight is probably the chief offender in this respect.

He says that the phrase "Miners' rights" was commonly used, and meant that the miners thought they had a right to all visible gold and the owners to the rest. Now, I have spent 35 years of my life in Nova Scotia, working in every gold district except a few, and at all branches of gold mining, and have not yet heard the expression "Miners' rights." I must therefore conclude that this idea exists only, or chiefly, in a few mines in the extreme east of the province, where my experience has been limited. Mr. Brown should know that there has been for many years a gradual weeding out of the characters referred to, the most of whom are now scattered over the continent, from Klondyke to Mexico. Nova Scotia's unexampled record, a few years ago when prohibition was an issue, as well as the low criminal record of the province, should convince the most prejudiced that its moral standing is among the highest. The census reports should also contain figures available for comparison, and I would ask Mr. Brown, as a misinformed friend, to consult them before diving into generalities. Had I not spent nearly a lifetime of experience in all possible positions among the gold miners of Nova Scotia, I would not have attempted the slightest correction of his statements. The 1,000 or so of Nova Scotian miners in Cobalt district, with a few exceptions, are set down as an honest, hard working class, well used to wet mines and other hardships, and are eagerly sought for where once tried.

But much as this crime deserves the strictest laws for its suppression, it is an old-fashioned sin, doomed to dwindle under the scientific and systematic methods of our time. These poor guilty devils know not how to pad pay rolls, get rebates on machinery ordered for their employers or make false reports on mines they are commissioned to examine. They listen in unfeigned ignoance to tales of stock watering, missuse of reserve and depreciation funds, and intricate semi-legal plans for freezing out poor partners. When the financial giants of the continent cause ruin and suicide in their struggle for cold cash, these common old-time thieves are not in it, and their feeble and dishonest efforts are rewarded with contempt by the honored manipulator who has made a million by selling stock in a worthless mine.

Nevertheless, with Mr. Brown I would welcome the advent of laws making gold stealing in the old, old way more difficult; but we hope that this is a dying sin, and probably will not survive the introduction of more legal and enlightened methods in the same line.

Now, Mr. Brown may not, and probably did not, intend to blacken as a class the characters of the many small, quiet and orderly mining communities scattered over the province, but his outspoken opinion published in such an influential journal as yours should, in fair play, be allowed an equally outspoken defense. The moral standing of these places can be ascertained by an examination of the county criminal records. These few lines are written in defense of a class, judged by exceptions, and who (as I know) feel deeply hurt by this unjust reference to them.

With an apology for the use of valuable space, I am,

Yours truly,

W. H. PREST,
Imperial Cobalt Mine, Cobalt.

To the Editor, CANADIAN MINING JOURNAL:

Sir,—In your editorial on the Canadian Mining Institute in the last number of THE JOURNAL, you aver that this Institute is, at the present time, not occupying the important position in the life of the country which it might be expected to occupy, considering the magnitude of Canada's mining interests.

While such may possibly seem to be the case, we must recognize that the Institute has done and is still doing a great amount of good work. At the meeting in the King Edward Hotel, Toronto, last March, a number of excellent papers were read. That these papers have been very generally appreciated is evident from the fact that a large number of them have since been reproduced in some of the leading mining journals in America and England. In this way the beneficial effect of the meeting is certainly being diffused throughout the whole mining population of the Dominion, perhaps more effectively than could be done by any other means, and many of the papers would probably never have been written but for the incentive offered by a gathering of sympathetic men who could be depended upon to appreciate the work of the writers.

Since the date of this meeting there is good reason for a period of quiescence, for in Canada the summer season must of necessity be the time when the busy mining engineers have the least leisure that their disposal to devote to the preparation of papers and plans descriptive and illustrative of the work that they may have been doing, or to the careful elaboration and logical deduction of general principles derived from their experiences.

The vitality of a society or institute depends largely on the opportunities which it affords for the comparison of notes and observations, and winter, rather than summer, is the season when these comparisons can most easily be made. It is also noticeable, too, that in years of special activity in mining the mining men have less time and thought to give to the general culture and elevation of their profession than in years of greater quietude.

In a country so extensive as Canada, it would seem to be quite impossible to get mining men together more than once a year, but at the annual meeting something more might be done to encourage acquaintance and good-fellowship among the members so collected together. An album might be formed each year with the photographs of all the members attending, or numbered buttons might be given out, as in many American societies, and printed or typewritten slips distributed which would give the names of the members opposite their respective numbers. Some such plan would be very useful in assisting in friendly intercourse.

Members living in Montreal doubtless derive great benefit from the library and rooms on Dorchester street

in that city. It is impossible that these rooms should be of very general interest to most of the members, scattered as they are from the Atlantic to Pacific, but the Institute must have some established home, and members living in other cities, such as Toronto, would be greatly benefited by the formation of local clubs, where opportunities for mutual intercourse and improvement would be afforded. I would suggest that the necessary steps be taken at once for the formation of such a club in this city.

The question raised by you of the amalgamation of the two offices of secretary and treasurer in one, and of the emoluments to be paid to one or both of these officers, hardly comes within the bounds of general discussion and might well be allowed to stand over until the next annual meeting of the Canadian Mining Institute.

Yours truly,

J. B. Tyrrell.

Toronto, August 8th, 1907.

EXCHANGES

The British Columbia Mining Record, June, notes the payment of dividends by five mining companies in British Columbia. *The Record* contains a very large amount of interesting information concerning the Province.

The *Journal* of the Franklin Institute, July, has a paper, interesting from both historical and technical points of view, on the Schuyler mine. The copper deposit was discovered by a negro slave in 1715, near Kingsland, new Jersey. Old records mention a shipment of ore in April, 1721, to Holland.

The *Proceedings* of the Cleveland Institution of Engineers, for March, is devoted entirely to a paper written by Mr. Robert Buchanan on "Principles and Practice of Foundry Work." In a section on liquid and solid contraction, the writer reaches the conclusion that both depend almost wholly upon the quantity of carbon which takes the graphitic form.

The South African Mines, Commerce and Industries, June 22nd, speaks of the Rand's poor return to investors. "After deducting from the dividends the amount of £3,728,363 due on amortisation account, there remains the sum of £1,837,609 as interest in the investment. This represents a small fraction over 3 per cent., and is totally inadequate as a mining return."

Ralph Stokes writes of "Mining in the Boundary Copper Field" in *The Mining World* of August 3rd. "There are different types of ore in the district, but infinitely the most important is that marked by the presence of magnetite, in association with chalcopyrite, pyrite and specular iron." In the same number Matt. W. Alderson begins a series of articles on "Practical Points for Prospectors."

"The Chemistry of the Iron Blast Furnace," by Bradley Strughton, a resume of the reactions which take place in reducing iron ore to pig iron, appears in *The Engineering and Mining Journal,* August 3rd. This article is an excellent example of condensation and clarity. Its acceptability accentuates the need, mentioned before in these columns, of a thoroughly complete and up-to-date text-book on the blast furnace.

"Coal and Wages" is the title of a leading editorial in *The Iron and Coal Trades Review* of July 26th. Pointing out the fact that the increase of the demand for British coals and their consequent jump in price may be but temporary conditions, superinduced by a growth in German domestic consumption and the consequent failure of Germany to supply its neighbors' demands, *The Review* deprecates the demand of the miners for a further increase of wages.

The Colliery Guardian, July 26th, in an editorial on the annual report of His Majesty's Inspectors of Explosives, alludes to the absolutely reckless disregard shown by miners for the precautions as to thawing nitroglycerine. Note is made of the influence of traces of mercuric chloride upon the official heat test, and the conclusion is drawn that to the lack of chemical stability due to carelessness in manufacture many hitherto unexplained accidents may be attributable.

Mines and Minerals, July, presents a leading article on the "Lead-Silver Deposits of Mowry, Ariz." The caving system of mining is used at the Mowry, and 80 per cent. of the ore is won without timbering. One disadvantage is that only one level can be stoped at a time. "The Panel Retreating System" for mining thin seams of anthracite is the subject of another article. A comparison of costs shows that this system can be used at a cost of little more than a third of that of the pillar-and-chamber system.

A valuable and interesting paper, "The Systematic Treatment of Metalliferous Waste," by L. Parry, A.R.S.M., is given in *The Mining Journal* of August 6. Mr. Parry states that so far as he is aware there is no works in existence which treat any and every kind of metallic by-product and waste. There are establishments where certain special classes of waste are treated. But there is much waste of a very complex character, which, because of the lack of facilities for treating it, has a commercial value far below its intrinsic value. Mr. Parry then develops his scheme of treatment. Further articles are to follow. These should be of interest to smelters of Cobalt ores.

In *The Engineering Magazine* for August appears a well-illustrated article on "Copper Smelting Practice in the Boundary District, British Columbia," by Frederic Keffer, president of the Canadian Mining Institute. In describing the Boundary copper ores, Mr. Keffer states that they display a wide range in composition. Neutral ores, however, predominate, and neutral mixtures of divergent ores may be had without the addition of barren flux. As most of the Boundary ores contain lime as crystallized calcite, they break up readily in the furnace and thus obviate the necessity of crushing finer than 4 inch to 6 inch diameter. The Boundary ores run from 1 to 3 per cent. in copper, the average being about 1 1-2 per cent. They also carry from $1 to $3 per ton in gold and silver.

The editor of *The Mining and Scientific Press* concludes, in the July 20th number of that journal, his notes on "Guanajuato. For sheer readability, conjoined with technical interest, these editorial articles are unique. The last paragraph is musical: "But beyond the mental imprints that it has been my endeavor to transfer to the pages devoted to this account of a journey in the southern land, I brought other memories and experiences, which were never developed; they remain blurred, and to none but myself have they a meaning. I have recollections of multi-colored facades; of sunlit walls, and cool patios, the sound of bells, and the crackling of whips . . . a stream of chocolate-colored humanity, a politeness that gave dignity to the commonplace, a squalor that soiled romance, and a sunshine that glorified everything." Mr. Rickard's letters should assuredly be collected and published in book form. They are worthy of a permanent place in technical literature.

PERSONAL AND GENERAL

Mr. J. Burley Smith, of Montreal, sailed for England on July 20th.

A mining recorder's office has been opened at Larder, in charge of Mr. J. A. Hough.

Professor Woodman, of Dalhousie University, has been rusticating for a long time at No. 6 colliery.

Dr. James Bonar, of Ottawa, has been appointed deputy master of the Royal Mint at the Capital.

Mr. C. E. Star is acting as temporary general manager of the Letete Gold Copper Company, at Letete, N.B.

Messrs. Simonds & Burns, mining engineers of New York, recently opened an office at Haileybury, Ont.

Dr. S. Petersky has been appointed medical superintendent of the Miners' Union Hospital at Sandon, B.C.

Mr. Hugh Fletcher, of the Geological Survey, has been registered at the Glace Bay Hotel for the past few weeks.

Mr. F. C. Laird, manager of the Willow River Mines, Carbiboo, B.C., has returned to Barkerville from a visit to the East.

Dr. H. S. Poole has returned to Halifax from a visit to the south of England, where he spent six months in geological research.

We regret to learn that Mr. G. Herrick Duggan, general manager of the Dominion Coal Company, is suffering from a severe attack of tonsilitis.

Dr. Frank D. Adams left for London last week to attend a meeting of the Royal Society, of which he was recently elected a Fellow.

Mr. Thos. Mills has resigned the mine management of the Western Fuel Company's No. 1 and Protection Island collieries at Nanaimo, B.C.

Mr. W. A. Aldridge is again visiting the East on the Consolidated Mining & Smelting Company's business, and expects to remain some weeks.

Mr. Chas. Rundsberg, formerly of Salt Lake City, Utah, has been appointed superintendent of the Dominion Copper Company's mines at Phoenix, B.C.

The engagement is announced of Miss Florence Mary Fenwick, of Kingston, Ont., to Mr. DeLorme Donaldson Cairnes, M.Sc., of the staff of the Geological Survey of Canada.

Mr. P. Davison Ahier has been appointed superintendent of the Cariboo-McKinney mine, at Camp McKinney, B.C. This property is now being operated under lease.

Mr. A. J. MacMillan, managing director of the Le Roi Mining Company, Rossland, B.C., returned to British Columbia at the end of July from a visit to England on the company's business.

Mr. J. W. Astley, formerly manager of the Le Roi mine at Rossland, has decided to make Victoria his permanent headquarters, and has opened an office there as a consulting engineer.

The Hon. Robert Drummond is at present on a well-deserved holiday on the other side. He is visiting the Scottish Lowlands and seeing England, in addition to a short trip to the continent.

Col. John Weir, one of the principal members of the original syndicate who purchased the Mother Lode mine in the Boundary district, which was subsequently acquired by the British Columbia Copper Company, has resigned from the board of that company, and is succeeded by Mr. A. N. Brady, of New York.

Mr. W. C. Mitchell, of Chesterfield, England, has been appointed superintendent of the Dominion Iron & Steel Company, Sydney, C.B., in succession to Mr. C. H. MacMillan, who recently resigned.

Mr. W. Morley, of Sydney, has been elected president, Mr. W. F. Jennison vice-president, and Mr. A. N. MacLennan secretary-treasurer of the Cape Breton Prospecting, Mining & Development Company.

David Noble, B.Sc., a graduate of the Kingston School of Mining, was drowned in the Kootenay River on August, 4th. Mr. Noble was employed in the chemical department of the Consolidated Company at Trail.

Mr. J. H. McDonald, general superintendent of the West Kootenay Power & Light Company, reports that the company's new power building ata Bonnington is now completed and the two units of 8,000 horse-power satisfactorily installed.

Mr. J. B. Hobson, the manager of the Guggenheim syndicate's hydraulic mine at Bullion, B.C., is on his way to New York to interview his principals. Mr. Hobson has refused to give the press any explanation for the suspension of operations at the mine.

Mr. W. Fleet Robertson, the Provincial Mineralogist of British Columbia, who has recently inspected the Nicola, Similkameen and other districts in Southern Yale, reports a strong revival of interest in mining in the Province. The Department is now receiving a very large number of letters of enquiry from prospective investors.

It is stated that a great deal of American capital is now being invested in copper mines in the Whitehorse district, Y.T. A number of properties have been recently examined by Mr. W. Thomas, formerly consulting engineer of the British Columbia Copper Company, and said to be at present representing the Standard Oil Company.

Mr. Hiram E. Donkin, C.E., has been appointed to the position of Deputy Commissioner of Public Works and Inspector of Mines for the Province of Nova Scotia. Mr. R. D. Anderson, of Glace Bay, will probably be appointed Mr. Donkin's assistant. Mr. Donkin has been fitted for his new duties by long experience in railway construction and mining in Nova Scotia.

Mr. J. C. Haas, one of the pioneer engineers of the Boundary district, but now practicing as a consulting engineer at Spokane, Wash, has gone north to examine a copper property at Bella Coola. In an interview Mr. Haas expressed the view that there was at present an inclination among capitalists in the United States to engage in mining undertakings in British Columbia, and he anticipated a revival of interest and activity in the Province's most important industry.

Mr. George Blake Walker is at present visiting the mines of the Dominion Coal Company. It will be remembered that, in conjunction with Mr. Emerson Bainbridge, he inspected the properties of the Coal Company in the summer of 1904, and again in 1905. Mr. Walker is recognized as eminent in his profession over in England, where he has always been known as a most progressive mining man. He has always taken a great interest in life-saving apparatus, and it was very largely owing to his exertions that the first Joint Rescue Station was erected at Tankersley, in the South Yorkshire coal field, and his name appears under the report of the South Yorkshire Coal Owners' Association on this matter in the first report of the Royal Commission on Mines, just published by the English Home Office.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Springhill.—In June of this year the employees of the Cumberland Railway Coal Co. made application to the Government for a Board of Arbitration and Investigation to investigate the causes of dispute between themselves and the Company. The Board, after patiently hearing the evidence pro and con, gave one, the most important case, against the Company. The other, or "local stone" question, against the men. The men, or a few at least, were dissatisfied with the finding of the Board. A further advance on current rates was demanded. It was promptly refused, as they must have known it would be. The men promptly applied for a further reference to the Board, which the Government granted. Meantime the lodge of the P. W. Association in connection with the collieries' notified the management that unless they conceded that which the Board withheld they would strike on the first day of August. The second board was composed of R. B. Murray, representing the workmen, and E. C. Archibald for the Company, with Judge Patterson, an appointee of the Government. The two representatives failed to agree in choosing the third man, so the aid of the Government as per Disputes Act, was invoked, and the Judge was appointed chairman. The Judge called the court to order and the workmen's side of the case was heard, and all evidence taken. The court then adjourned till next day (Aug. 1). August first the strike was on. The Board met as per adjournment, but the Judge, whose dignity forbade participation in a farce, promptly dismissed the Board on finding the men were on strike. It is a very unfortunate situation. The Company has at last taken the stand long expected. The prevailing average wage where the demand for advance was made, is $3.41 per day of ostensibly eight hours, but which is really earned in six hours. The Company thoroughly understand the conditions and will unquestionably concede nothing in the way of advance. The men have lost public sympathy through ignoring or repudiating the finding of the Board, formed on their own application. The situation is a most serious one for Springhill and its people.

Springhill mines were never in better or safer condition. The output from the collieries had attained normal condition and was steadily increasing, after the winter's experience of gob heating in No. 3 mine. This latter condition was overcome and the section cooled. The full force of men was again at work and doing well.

Springhill is a town with but one industry.

W. D. M.

Glace Bay, August 1st, 1907.

Dr. Ami, of the Geological Survey, is down here from Ottawa, and he is exciting much astonishment to the lay mind by his avidity for fossil remains. He says that the Glace Bay coal field is surprisingly rich in paleontological fauna and flora, and that in particular its wealth of animal remains is such as to rejoice the eyes and glad the heart of a paleontological geologist.

It is, of course, a well-known fact that the measures of the Cape Breton coal field afford a numerous veriety of fossil impressions, but since Mr. Brown wrote his classical work on the coalfields of Cape Breton, we are not aware that any extensive collection or classification has been attempted. This is, of course, entirely apart from the routine work of the Geological Survey. Dr. Ami deplores the fact that there is no museum in Cape Breton, and from the way he is amassing specimens there may presently be need for one. The firm impressions to be found above the Emery Seam are perhaps not to be excelled in any coalfield, while the ripple marks, footprints and raindrops to be found in the finely laminated sandstones running through the cliffs along the seaboard from Point Aconi to Mira Bay, have often been referred to in standard works on paleontology.

Apropos of this matter it may be mentioned that the English Institution of Mining Engineers is attempting to solve the long-debated problem of the correlation of the thick coal of Staffordshire with the coal seams of Lancashire and Yorkshire on either side of the Pennines by means of fossil "mussel beds" which have been found in this region to be very persistent in their distribution. The members of the Institution have been requested to send in specimens of fossil shells with particulars of their exact origin, and definite results tending to the more exact correlation of the now disputed measures are confidently hoped for. There can be no doubt that extended investigations of this nature in Cape Breton coalfields would yield valuable results.

We rather think Dr. Ami will need a box car to convey his specimens to Ottawa.

Glace Bay, August 1st, 1907.

It is reported on excellent authority, but as yet unofficially, that Mr. Hiram Donkin, at present the Chief Engineer of the Dominion Coal Company, has been appointed Deputy Commissioner of Public Works and Mines in Nova Scotia. It is understood that Mr. Donkin's duties will also include the supervision of roads and railways in the Province.

Mr. Donkin's connection with the Dominion Coal Company dates from 1893. From 1896 to 1901 he was the Resident Manager, and resigned his position when the Steel Company assumed the properties of the Coal Company under the lease which was afterwards cancelled. Mr. Donkin has held his present position since 1904.

The appointment has given much satisfaction in Cape Breton, where Mr. Donkin is deservedly popular, and it is generally conceded that he is a most suitable person for the post. His previous experience particularly fits him for the work of the Deputy Commissioner of Mines, and his sterling integrity ensures the careful safeguarding of the mineral interests of the Province, while his technical attainments are undoubted.

Mr. Donkin has given a good deal of his time to the advancement of the cause of technical education in Nova Scotia, particularly in the mining districts, and his labors in this direction were recognized when he was made a Master of Engineering of King's College. The status of technical education throughout Nova Scotia is such that the appointment of Mr. Donkin to this position will meet with the hearty approval of all the friends of this woefully neglected, but most important matter.

Altogether the appointment is regarded down here as a most happy one, and we congratulate the powers that be on their choice.

We understand that Mr. Donkin will commence his duties in Halifax on the 15th of August.

Glace Bay, 2nd August, 1907.

Work at the mines around Glace Bay has gone on without any serious interruption during the month of July, but the output is not by any means so large as required. This is altogether due to men staying off work, as there is really no scarcity of labor around the mines. The only trouble is the number of holidays taken by the men during the summer weather, and after pay day. The organization and equipment of the Dominion Coal Company's mines could easily have raised 360,000 tons for the month of July, but as a matter of fact they only hoisted 312,000 tons.

Work at the Hub Mine has gone on rapidly, and the management expect to raise coal by the end of this month. The water has been lowered to within 300 feet of the first level of the submarine workings, and as the volume of water is now much less it is being lowered more quickly. The head frame and bankhead is complete and the machinery is all in place. The pulleys will be hoisted this week.

The Drager life saving equipment has now all arrived, and the work of erecting the Rescue Station is being pushed. The equipment comprises ten helmet and ten mouth breathing apparatus, pneumatic smoke goggles, nose clips, oxygen refill pump, over two thousand potash cartridges, testing apparatus for CO_2, and about 1,500 feet of oxygen. The Company are arranging for the services of a competent instructor from the other side, and their Rescue Corps will presently be an accomplished fact. This innovation will cost the Coal Company between $5,000 and $6,000 for initial outlay, and the expenses of training and providing refills will not be inconsiderable. They will have the best Rescue Station outside of Germany, and although we fervently hope the occasion for its practical use will not arise, if ever it should the apparatus will prove of inestimable benefit, and will more than justify the expenditure. The citizens of Glace Bay will be able to boast that they have the only properly equipped Rescue Station on this side of the Atlantic. They do claim at present on picture postcards, that are printed, by the way, in Italy, that No. 2 is the "largest coal colliery" in the world.

This latest addition to the Coal Company's equipment is in line with their general policy during the past five years, a policy that is making their mines safer for the workmen every day. The abolition of the use of black powder, the introduction of "company shotfirers," in place of the pernicious system that formerly prevailed, the provision of the Ackroyd & Best electric relighting safety lamp, the attempts to introduce a safety explosive wherever possible, are a few of the things that might be named in this connection. None of these innovations but add to the general cost of mining, yet we venture to say the Company's policy is in line with all that is progressive in coal mining, and is justified and more than justified on the grounds of conservation of property and human life.

"Coal v. Steel" is about the sole topic of conversation in this neighborhood. Perhaps the only people who will benefit from the legal fraternity and the "fourth estate." Public opinion on the matter varies as the locality. Glace Bay is for Coal and Sydney for Steel. Perhaps never before has there been such an infliction of expert opinion on the newspaper readers of Cape Breton, and the old chestnut as to the three grades of liars is being trotted out afresh at every opportunity. No doubt by the time the Courts have decided the question the Caledonia workings will be drawing air from No. 6 Mine, and the surveyors will be wondering whether they have left sufficient coal in their barriers against No. 6 workings. All other matters in connection with this trial are sub judice and are better left alone—but No. 6 Mine not on the Phalen Seam? Ask a man from Schooner Pond and watch him smile! They have very fixed ideas at Schooner Pond.

QUEBEC.

Mr. A. O. Norton, Coaticook, Que., is preparing to develop the Suffield Mine at Suffield, Que., of which he is the proprietor, on a larger scale than has been hitherto done. Machinery to the value of $20,000, including a new boiler, air compressor, and hoisting plant, has been purchased and is now being installed.

The Suffield is one of the numerous copper properties that were opened in the vicinity of Sherbrooke over forty years ago and that were subsequently closed during the long interval of low priced copper. It has long been known to contain a large body of ore generally estimated at 3 p.c. copper. But during the past year Mr. Norton has developed a large amount of ore of a higher grade said to average nearly 7 p.c.

No smelting facilities have as yet been provided. The mining work is under the direction of Capt. Wm. Jenkins.

ONTARIO.

Montreal River, July 22nd.—It was in the middle of last winter that the rush into the new Montreal River silver district began. From January on, the prospectors tramped up the Montreal River on snowshoes from Latchford, and overland from New Liskeard, to stake claims. Most of the claims in the district are "snowshoe staked," the object in most cases being to stake and record a claim and then sell it at a moderate price to some man with capital, who would prospect it in the spring. This involves, in ninety-nine out of one hundred instance, perjury in recording the claim, when one has to swear to the discovery of valuable mineral in place; but perhaps the law is defective on this point and there may be some excuse for the false oath under the circumstances. This seems to be the attitude of the government, as no action for perjury has been instituted even in the most evident and indisputable cases.

The district is swarming with prospectors at present, and on claims where valuable discoveries have been made, and in the vicinity of these claims, considerable stripping and blasting is being done.

Silver has been found, so far, in two places, at White's, about 7 miles north-west of Lady Evelyn Lake; and in the township of James and the adjoining township of Smyth, about 25 miles north of the former. At White's, which Prof. W. G. Miller visited last spring, the vein shows at one place a width of about three inches of native silver. There is an equally good, or perhaps, a better showing on Downey and Darragh's claim in James. In Smyth there are several veins showing an inch or so of native silver. In some of these veins in Smyth, the silver is in a crystallized form, having a beautiful arborescent or branching structure. The usual occurrence, so far as noted, is in nuggets, in wires forming a sort of filigree effect, or in flakes scattered through the gangue. The gangue minerals are calcite, quartz and barite. In some veins calcite and quartz occur together. In one place there has been found quartz with cavities from which have been weathered out crystals of calcite.

The veins in the Montreal River district, so far as they have been explored up to the present, show a marked difference from most of those found in Cobalt. The Cobalt veins have some degree of uniformity in their width and in their silver values, whereas the veins in the new district are extremely erratic in these respects. A light crack will develop into a vein of considerable width in a short distance, and a vein which in one place carries no silver, or almost none, will a few feet off be what is ordinarily called "solid silver." Keeping these facts in view, it will be seen that the value of the veins is extremely problematical. If the pockets containing silver are large enough and frequent enough, the properties will no doubt prove very valuable. There has not been enough development work done so far to determine anything as to this point.

The predominating rocks in the new silver area, so far as examined, are the Lower Huronian quartzite, and diabase. There is also Laurentian granite and a little Keewatin. The granite areas are, of course, rough. The quartzite areas are

level, the few hills in them being usually diabase. These hills seem to be the remainder of a huge sheet of diabase which at one time covered the country. Dykes of diabase are also common. It is in the diabase that all the silver has been found. There are limited areas of conglomerate, also, but unlike the conglomerate of the Cobalt district, no mineral has been discovered in it yet.

Last spring the government created the Montreal River special inspection district, which includes the new silver area. In this field, as at Cobalt, every claim must be examined and passed by an inspector before a patent for the mining rights is granted. This is meant to prevent the blanketing of claims (which occurred at first in Cobalt) and seems to work in a satisfactory way. There are now eight inspectors at work in the district. This system tends to hasten the development of the country, since the owners, or rather those who hope to be owners, of claims on which there has not been enough discovered to pass inspection, work hard to find something before the inspector comes round. The inspectors in their decisions give the real prospector, the man who wants to work, every possible chance.

There is now a line of boats, steam and gasoline, running from Latchford to Bear Creek in James Township, 40 miles up the Montreal River. At Bear Creek a post office has recently beea established—Elk Lake P. O.—and there are stores and restaurants there and at other points along the line. There is quite a settlement already at Bear Creek, and it looks as if it were going to be the future town of the district.

ALBERTA.

COLEMAN, ALTA.

At Frank, Alberta, the zinc smelter of the Canadian Metal Company lies idle. The plant is extensive, entirely up-to-date, and represents an enormous investment. It is the only smelter of its kind in Canada and has a capacity sufficient to supply the home market. No sooner was it in working order than the American Government placed a tax of 1½ cents a pound on spelter, thus shutting off the market of the Western States to the Canadian enterprise. At the same time the American producers retain the Canadian market, which is mostly in the Eastern Provinces, since they have no duty to pay on spelter coming into Canada and have the advantage of ½ cent a pound in freight over their far-western competitor. As a result, zinc ore, which must be taken out with the lead in the British Columbia mines, is thrown on the dump. This is regrettable because the capital invested in lead mining might have an additional return from zinc and because the capital invested in the Frank Smelter has no return at all. Moreover the profitable production of spelter has proven to be more hazardous than the smelting of most other ores, and the initial attempt at Frank, so far removed from any similar plant, thus compelling the managers to educate their experts from recruits, called for all the safeguards Canada could lend to it. The sensible solution would be to tax spelter. If the Dominion Government wished further to encourage the industry, they might bonus spelter for a few years, as they do steel. The miner needs no bonus for extracting an ore which he mines now for nothing, since he would be benefitted sufficiently by having a market for his ore. Here is work for the Alberta, British Columbia and Dominion Governments. Meanwhile the Canadian consumer is paying to the American Trust $5.90 for zinc that is quoted in London at $5.18, because the Americans can uphold the price while they have the market on which to dump their surplus product.

Car Shortage.—Many of the Coal Mines along the Crow's Nest Railway are suffering for want of cars. They either have no place to store coal or cannot afford to handle it a second time. The companies that also make coke are further handicapped by not being able to get out enough slack for their ovens since they have no place for the screened coal. This again threatens the smelters up the line that are waiting for coke. Apart from this the operators, who install costly plants, calculate on working their full capacity, depending on daily profits to offset the wear and tear of machinery, mine repairs and wages of a permanent office and engineer force, not to mention a return on their investment. In these days, too, miners are scarce and operators cannot hold their men when steady work attracts them elsewhere. Thus one operator gains prestige in the market at the expense of a less fortunate competitor. Last, but not least, the miners lose "shifts," which are needed for bread and butter.

Strathcona, Alberta.—At Strathcona, Alberta, the Clark Dredging Co., of Chicago, manufacturers of the Clark Hydraulic Dredge, are installing a plant for the Northern Dredging Co. The latter has a concession from the Dominion Government for fifteen miles of territory along the Saskatchewan River. The ground was tested last fall for gold and platinum. The Clark Dredge is a combination between the bucket and suction dredges. It digs the gravel and the suction elevates it. The plant will be in operation in two weeks.

GENERAL MINING NEWS

NOVA SCOTIA.

Sydney.—The transfer of the Port Morien coal areas to the North Atlantic Collieries Company has been completed. The erection of houses will be started. The Government dredge is deepening the harbor.

The action of James T. Burchell against the Dominion Coal Company is reported to have been settled out of court. The amount involved was $116,200, and the litigation arose over certain coal areas at Point Aconi.

Mr. F. W. Harbard, the English authority on the metallurgy of steel, is one of the witnesses called by the Dominion Iron and Steel Company in its suit against the Dominion Coal Company.

At Catalone near Lonisburg, C.B., an asbestos mine is being opened. American capital is in control.

Londonderry.—It is reported that the Londonderry Iron and Mining Company is to erect a car-wheel foundry on its property at Londonderry. Here they will use the pig-iron from their own blast furnace and will supply car-wheels to the Silliker Car Works, a new concern being started in Halifax.

Chignecto.—On August 1st the Maritime Coal Railway and Power Company put in operation their Chignecto power plant, the only plant on the American continent where power is generated at the pit-mouth for distribution. The machinery includes a 800 h.p. Robb-Armstrong engine, and an alternating geneator of 100 kilowatt capacity, manufactured by the Canadian Westinghouse. During the opening ceremonies, a telegram of congratulation was received from Thomas Edison, whose father, by the way, lived for some time in Nova Scotia.

Springhill, July 31.—Thirteen hundred employees of the Cumberland Coal and Railway Company quit work this evening. The men resented deeply the finding of the Conciliation Board, appointed under the provisions of the Lemieux Act. as regards "local stone." The Board, compoes of Jus-

tice Patterson, chairman, P. S. Archibald, representative of the Company, and R. B. Murray, representative of the men, is continuing its sessions.

ONTARIO.

Cobalt.—The Coniagas is the leading shipper for the first six months of 1907. 1,448 tons is its record for that period. The shipments from the Nipissing were 1,269 tons and the O'Brien 1,144 tons. For the three months ending June 30th, the O'Brien paid $145,000 as royalty to the Government. The royalty is set at 25 p.c. of the value of the ore at the shaft head.

The Rand-Jenckes Company on August 1st had eight cars of machinery under order and waiting to be unloaded at Cobalt station. To the Nipissing, two 125 h.p. boilers were consigned; Nova Scotia, the same; Rochester, the first half of a 12 drill compressor. The Big Ben mine in Bucke has an order for the first half of a 12-drill compressor, 80 horse-power boiler, drills and hoist.

The Western Federation is attempting to organize the T. & N. O. employees, with the avowed object of suspending traffic by declaring a strike. It is high time that the Government intervened.

Alexander McIsaac, a native of Dartmouth, N.S., slipped and fell down the shaft of the Temiscaming and Hudson Bay Mine on August 3rd. Death was instantaneous.

It is estimated that on the Tretheway dump alone, over $175,000 of low grade ore is available for concentration.

Kenora.—The Bully Boy gold mine is to be re-opened. The shaft is now down 215 feet. About 200 feet of drifting has been done.

Port Arthur.—The Atikokan Iron Company's blast furnace was blown in on July 1 th. The promoters of this new venture are Messrs. MacKenzie and Mann associated with whom are certain Duluth and Chicago gentlemen. The Company controls the Atikokan Iron Mines, 100 miles west of Port Arthur on the Canadian Northern Railway. In addition to the furnace and coke ovens a large roaster has been erected, and put in operation. The ore is a magnetite carrying over 1 per cent. of sulphur. Besides eliminating the sulphur the roasting renders the ore much more amenable to further treatment. The ore is transported to the plant in 35-ton cars. It is dumped into pockets and hoisted to the top of the roaster. The fuel in roasting is the waste gas from the furnace. The blast-furnace has a capacity of 100-tons of pig iron per day. Coke is supplied by 100 beehive coke ovens. The capital expenditure involved in the erection of this plant reached the sum of $1,300,000. Three quarters of a mile of elevated track and three miles of other track have been laid around the plant. The major part of the pig-iron output has already been contracted for by the Canada Foundry Company.

The old Beaver silver mine will be unwatered as soon as possible. Machinery is being sent by rail to Silver Creek, thence by road to the mine. The Beaver was closed 16 years ago. There are buildings on the property.

BRITISH COLUMBIA.

Fernie.—An upheaval of the floor and an outbreak of gas in Room No. 11, No. 2 Mine, Coal Creek, one of the Crow's Nest Pass Mines, resulted in the death of an employee, Robert Bell.

W. C. Thomas, manager of the Dominion Copper Co., has had plans drawn for a two stand converter plant for the smelter. At present the matte from Boundary Falls is being blown to blister copper by the converters of the B. C. Copper Co.

Ten stamps are now dropping steadily at the Cariboo-McKinney. In all likelihood ten stamps more will be put into commission in the near future.

The Diamond-Texas shaft is down 150 feet in quartzite.

At the Strathmore Mine, Greenwood, the shaft has been sunk to 150 feet. A 10-horse power electric hoisr forms part of the equipment.

The Consolidated Mining and Smelting Company of Canada, Ltd., has secured control of the properties of the Phoenix Amalgamated Copper Mines, Ltd., by purchase and has also secured options on a number of other mineral claims near Phoenix. The Phoenix Amalgamated group consists of eleven claims, chief of which are those of the old War Eagle, operated seven years ago by the War Eagle Copper-Gold Mining Company. These claims adjoin the Granby group in the south. A 20-drill air compressor is to be installed on the War Eagle at once and men and supplies are being hurried to the mine.

The Granby Consolidated Company is contemplating increasing its smelter capacity from 3,000 to 4,000 tons per day.

Slocan.—The Hewitt mine, near Silverton, Slocan Lake, has been sold to New York parties. The price is reported to be about $200,000. Discovered in 1892, the Hewitt was worked during 1900-1903. Since January 1904 it has shipped 1,000 tons of ore.

The drift on the 200-foot level of the Krao has been continued and the size of the ore body is reported constant.

The Payne, it is reported, has been reorganized with a capital of $500,000.

Phoenix.—All three of the B. C. Copper Co's. large furnaces are in operation. An ore tonnage of nearly 2,000 tons daily is being smelted. This implies a monthly copper production of nearly 1,500,000 pounds.

Boundary.—Both the B. C. Copper Company and the Dominion Copper Company have made contracts with the Intercolonial Coal and Coke Company for Coke supplies for their smelters.

The large crusher for the Granby's Gold Drop mine was shipped from Sherbrooke, Que., on August 1st. Ground has been broken for installation of the crusher and ore bins.

Alberta.—The International Coal & Coke Company has closed a contract with the C. P. R. for its entire coal output. A daily output of about 2,500 wi,l soon be reached.

There are one hundred and thirty coal mines in Alberta. Seventy of these are producers, their output ranging from 5 to 500 tons per day. Nearly every mine in Southern Alberta is working a eight-hour day, many of them "bank to bank." The large Thorinville mine, in northern Alberta, although not a union mine, works an eight-hour day.

GREAT BRITAIN.

The first meeting of the Governing Body of the Imperial College of Science and Technology, was held in London in July. Lord Crewe was unanimously elected Chairman, and on taking the chair was handed by the President of the Board of Education, the Rt. Hon. R. McKenna, the Letters Patent containing the Grant of the Charter of the Imperial College.

In the House of Commons the other day the Home Secretary, Mr. Gladstone, said that he had come to the conclusion that there should be a distinct mines branch in the Home Office. It appeared to him that this was necessary, but the question was so intimately concerned with the organ-

ization and strength of the mines inspectorate throughout the country that he thought best to wait for the deliberate opinion of the Commission before anything was done.

In the recently issued report under the Explosives Act it appears that the number of accidents by fire or explosion in British coal mines last year was 379, which is considerably above the average of the last ten years. The greatest number of accidents were due to sparks, flame, etc., while next in order were accidents from ramming or stemming the the charge, and striking unexploded charges in the removal of debris.

YUKON.

The Yukon Smelting and Power Company are planning the erection of a smelter and electrical power plant at White Horse. As the haul to the railway is now $4 per ton and railway and steamer freightage and smelter charges $7 per ton, when copper ore is sent to the Coast smelters, the new concern will keep a great deal of money in the district. The Puebla and Arctic Chief mines have many thousand tons of ore in sight. The Grafter and Arctic Chief are producing about 50 tons of ore per day.

FRANCE.

It is estimated that the new 8-hour law applicable to coal mines will cause a considerable reduction in the production of coal, and necessitate the provision of 16,000 additional miners to make up for this deficiency in the output.

SPAIN.

General interest has been aroused by the report of the existence of large deposits of iron and copper ore in Galicia, to which representatives from various syndicates both British and of other nationalities are now flocking.

INDIA.

The coal production of India (chiefly Bengal) for the year 1906 is estimated in the Administration Report on the Railways in India to have been 9,261,714 tons, or an increase of about 800,000 tons over the output for 1905. Of this, the Indian railways consumed 2,878,281 tons.

SOUTH AFRICA.

The gold production for May was 524,477 oz. valued at £2,227,838. The average value per ton milled was as follows: Rand, 33.68s.; Outside, 36.10s.; Transvaal, 33.76s.

Recent cablegrams state that there is at present a want of cohesion among the strikers, and other signs indicate that the strikers are anxious to terminate the struggle. There have been one or two outrages of late including the dynamiting of a house in Johannesburg, by which three persons were killed and several injured.

The Government of the Transvaal proposes to introduce legislation in line with the New Zealand Compulsory Arbitration Act, and commenting thereon the London Mining Journal remarks that in the light of the experience of the last two or three years such an addition to the statute law of the Transvaal can hardly be regarded as a measure of progress; and adds: "The institution of these obligatory courts of arbitration have not been able to prevent workmen from striking or compel them to return to work after an award has been given." At least recent attempts in Canada in the direction of Government interference in labor differences have not been attended with notable success.

UNITED STATES.

The output of pig-iron for the first half of the current year is estimated at 13,500,000.

The coal fields at Batan in the Phillipines are described in a report recently issued by the Mining Bureau. Both lignites and bituminous coals have been mined and are of good steaming quality. It is estimated that in one square mile investigated there are 15,360,000 tons of workable coal.

The American Census Bureau at Washington has issued a final report on the iron and steel industry of the United States, from which the following figures are taken: In 1890, the number of establishments was 719; in 1905 this had decreased to 606, but the capital invested had increased from $414,014,844 to $948,689,840; the salaries paid had more than trebled, the number of wage earners doubled, while production increased from 16,264,478 tons in 1890 to 34,844,933 tons in 1905.

A correspondent of "The Mining World" (Chicago) gives an interesting account of a trial run of a Heroult electric smelter on iron ores in California, which he pronounced a great success. It is thought that the Shasta county magnetite can be converted into pig iron of the best grade and sold in San Francisco at $16 a ton. The present price of pig iron is that market is $31 a ton, being chiefly imported from Europe. At Heroult where the experiments were conducted there is an extensive iron region and the ores can be mined and carried to the smelter at a very low cost.

Messrs. Allan, Whyte & Co. also made some little time ago three lengths for the Jupiter Gold Mining Co., Ltd., South Africa, on same principle and which weighed fully 6½ tons each.

Messrs. Allan, Whyte & Co., Clyde Patent Wire Rope Works, Rutherglen, Glasgow, have just completed the manufacture of three large Winding Ropes for the East Rand Proprietary Mines, Ltd., South Africa.

The Ropes, which in the aggregate measure 15,000 feet and weigh 20 tons, are made on the taper principle to meet the problem of winding heavy loads from great depths. They were inspected during manufacture by Mr. N. Wilson, Consulting Mechanical Engineer for the Group, who is at present in this country.

STATISTICS AND RETURNS

Shipments from the Cumberland Coal and Railway Company Springhill Collieries for the month of July were 37,057 tons.

Cobalt ore statement, period ending July 20th:—

July 16th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 40,000 lbs.

July 16th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 66,090 lbs.

July 18th, Coniagas Mine, Oxford Copper Co., Coppercliffe, Ont., 63,090 lbs.

July 19th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 42,000 lbs.

July 19th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 64,000 lbs.

July 18th, Silver Queen, Canada Copper Co., Coppercliffe, Ont., 87,000 lbs.

July 18th, Hudson Bay Mine, Canada Copper Co., Coppercliffe, Ont., 45,170 lbs.

July 18th, Silver Leaf, Canada Copper Co., Coppercliffe, Ont., 43,518 lbs.

July 19th, Nipissing Mine, Nipissing Mining Co., New York, N.Y., 63,550 lbs.

Grand Total—514,418 lbs.

Cobalt ore statement, period July 22 to July 27, 1907 :—

July 23rd, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 42,000 lbs.

July 23rd, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 64,000 lbs.

July 25th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 62,000 lbs.

July 27th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 64,000 lbs.

July 27th, Coniagas Mine, American Smelting and Refining Co., Perth Amboy, N.J., 80,000 lbs.

July 25th, Buffalo Mine, Chas. L. Dennison, New York, 60,000 lbs.

July 25th, LaRose Mine, American Smelting and Refining Co., Perth Amboy, N.J., 40,000 lbs.

July 25th, LaRose Mine, American Smelting and Refining Co., Perth Amboy, N.J., 40,000 lbs.

July 26th, Trethewey Mine, American Smelting and Refining Co., Perth Amboy, N.J., 50,300 lbs.

July 26th, Nipissing Mine, Nipissing Mining Co., New York, N., 60,975 lbs.

Grand Total—563,275 lbs.

Cobalt ore statement period July 29 to Aug. 3, 1907 :—

July 20th, LaRose Mine, LaRose Mining Co., New York, N.Y., 63,155 lbs.

Aug. 1st, LaRose Mine, American Smelting and Refining Co., Perth Amboy, N.J., 42,250 lbs.

July 31st, Nipissing Mine, Nipissing Mining Co., New York, N.Y., 87,843 lbs.

Aug. 1st, Nipissing Mine, Nopissing Mining Co., New York, N.Y., 63,710 lbs.

Aug. 2nd, Nipissing Mine, Nipissing Mining Co., New York, N.Y., 43,165 lbs.

Aug. 2nd Nipissing Mine, Nipissing Mining Co., New York, N.Y., 45,990 lbs.

Aug. 3rd, Nipissing Mine, Nipissing Mining Co., New York, N.Y., 65,592 lbs.

Aug. 3rd, Nipissing Mine, Nipissing Mining Co., New York, N.Y., 41,100 lbs.

July 31st, Buffalo Mine, Canadian Copper Co., Coppercliffe, Ont., 40,000 lbs.

Aug. 3rd, Buffalo Mine, Chas. L. Dennison, New York, N.Y., 60,000 lbs.

Aug. 1st, Nova Scotia Mine, B. H. Stewdler, Perth Amboy, N.J., 66,000 lbs.

Aug. 1st, O'Brien Mine Canadian Copper Co., Coppercliffe, Ont., 61,000 lbs.

Grand Total—679,805 lbs.

L. Vogelstein & Co., New York, give the following figures of German consumption of foreign copper for the months of January to June, 1907 :—

Imports of copper	59,637 tons
Exports of copper	4,130 tons
Consumption	55,507

As against consumption during the same period in 1906 of 61,115 tons. Of this amount 45,776 tons were imported from the United States.

DOMINION COAL COMPANY.

Outputs and Shipments July, 1906 and 1907 :—

No. 1	45,266	44,160
No. 2	51,701	55,510
No. 3	34,876	34,210
No. 4	49,751	45,350
No. 5	55,603	54,050
No. 6	6,005	16,760
No. 7	11,381	23,400
No. 8	25,052	23,400
No. 9	33,961	30,300
No. 10	3,695	9,080
	318,291	312,820
Shipments	353,247	353,738

Cobalt's Total production :—

	Tons of Ore.	Value.
1904	$ 158	$ 136,217
1905	2,144	1,273,196
1906	5,129	3,900,000
1907 (6 mos.)	6,431	4,890,019
Total to date	13,862	10,000,000

Sydney Mines.—The total output of the four collieries of the Nova Scotia Coal & Steel Co. for the month of July amounted to over fifty-five thousand tons, the figures for the different collieries being as follows :

No. 1	22,393 tons
No. 2	24,564 tons
No. 3	7,760 tons
No. 4	500 tons

BRITISH COLUMBIA SHIPMENTS.

Rossland shipments for the week ending July 13th increased to 8,055 tons.

Shipments for the week were as follows : Centre Star, 5,010; Le Roi, 2,240 ; Le Roi No. 2, 595 ; White Bear, 210 ; total for week, 8,055, and for year to date, 146,147 tons.

At Trail smelter there was received during the week 5,781 tons, while the Le Roi smelter at Northport received 2,240 tons.

Shipments for the week ending July 20 :—

Shipments for week ending Aug. 3rd :—

	Week.	Year.
Boundary	30,537	675,234
Rossland	4,140	161,998
Slocan-Kootenay	3,025	76,746

The total shipments from the mines in the above districts for the past week were 44,472 tons, and for the year to date 828,898 tons.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—10 to 14 cents per lb.
Arsenic, white—7½ to 7¾ cents per lb.
Barytes, crude—$11.25 to $1.75 per lb.
Bismuth—$1.50 to $1.75 per lb.
Cadmium—$1.46 to $1.50 per lb.
Carbons for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 50 cents per lb.
Corundum—7 to 9½ cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$25 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 to 50 cents per lb.
Platinum, ordinary metal—$26 per ounce.
Platinum, scrap—$20 to $21 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump, 10¼ to 11½ cents per unit.

MARKET NOTES.

Spelter.—Market is still declining. New York 5.85 cents per lb. ; London £23 2s.

Lead.—New York steady at 5.25 cents per lb. ; London, £19 10s. for Spanish lead.

Tin.—Market is flat. New York, 40 cents per lb. ; Kondon, £182 for spot.

Copper.—Market stagnant ; New York, Lake 21½ cents per lb. ; electrolytic, 20½ cents per lb. ; London, spot for standard, £86.

Silver, per ounce.—July 18, 68⅓ cents ; July 19, 68¼ ; July 20, 68⅝ ; July 22, 69⅛ ; July 23, 68⅞ ; July 24, 68⅞ ; July 25, 68¾ ; July 26, 69 ; July 27, 69⅛ ; July 29, 69⅜ ; July 30, 69⅜ ; July 31, 69½.

Pig Iron.—Pittsburg, Bessimer pig, $22.50 ; No. 2, Foundry, $23.50.

Iron Ore.—Bessemer Old Range, $5.00 ; Bessemer Mesali, $4.75 ; Non-Bessemer Old Range, $4.25 ; Silicious non-Bessemer, $2.50.

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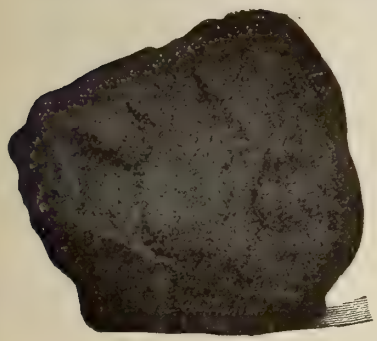
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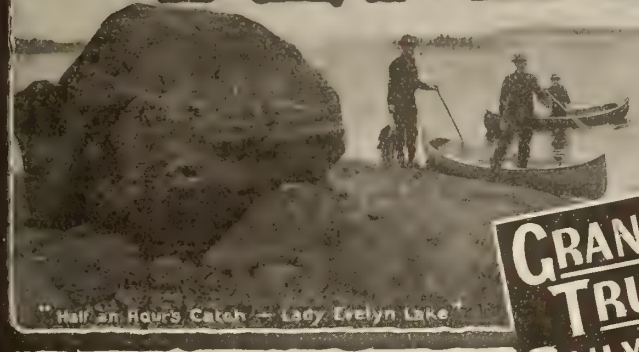
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SYNOPSIS OF CANADIAN NORTH-WEST MINING REGULATIONS

COAL—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

QUARTZ—A person 18 years of age, or over, having discovered mineral in place, may locate a claim 1,500 x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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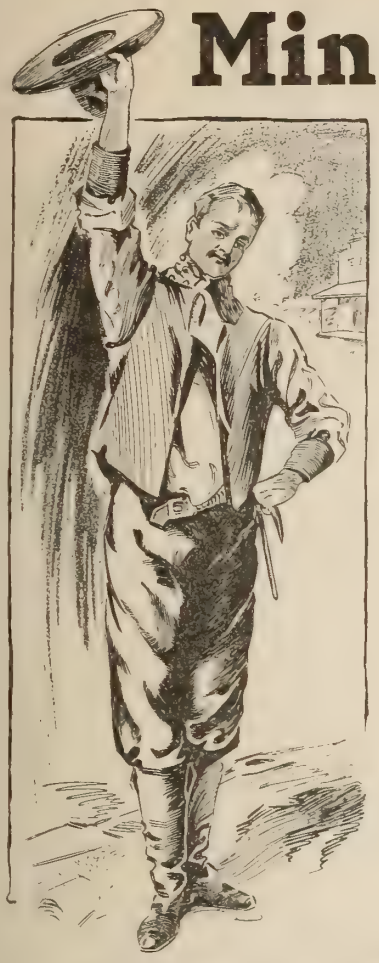
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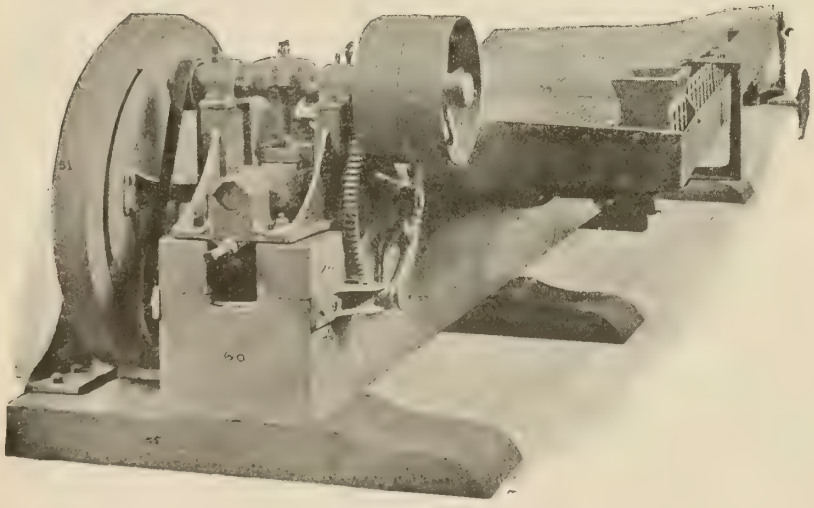
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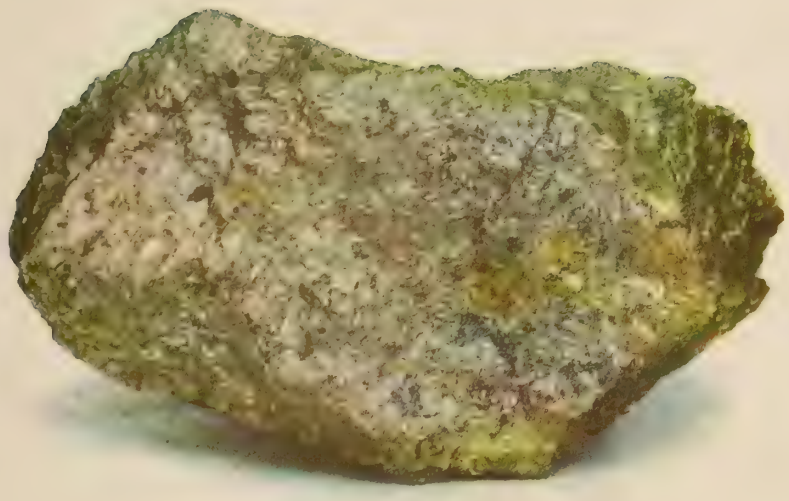
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The Canadian Mining Journal

OL. I. No. 12 New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 14



Copper-Nickel Ore from Sudbury

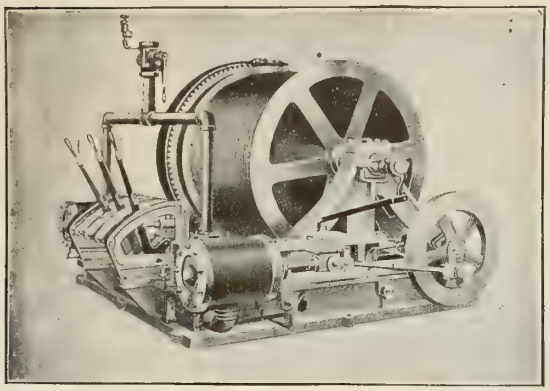
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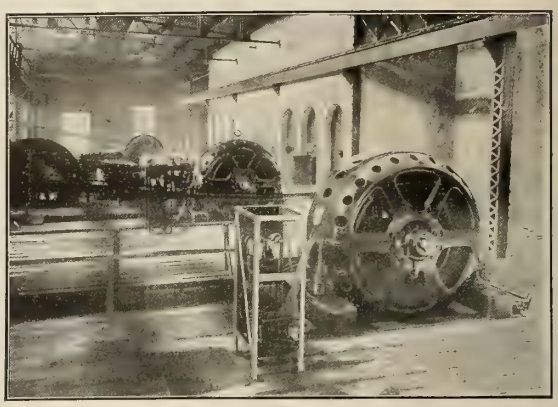
WANT ADVERTISEMENTS - - - XVII
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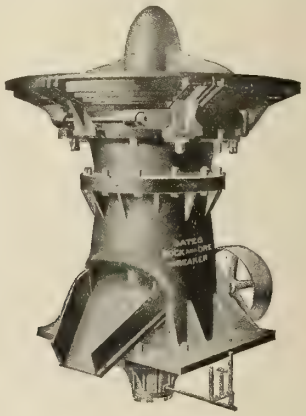
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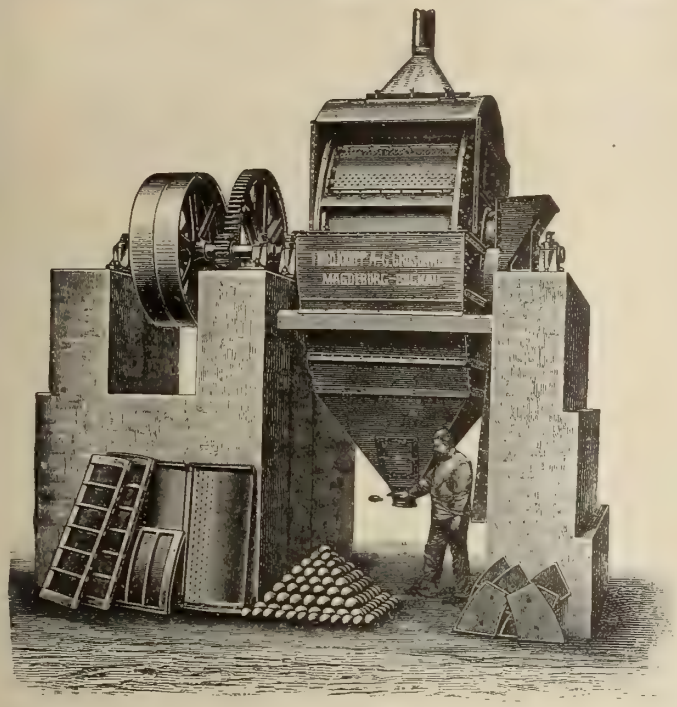
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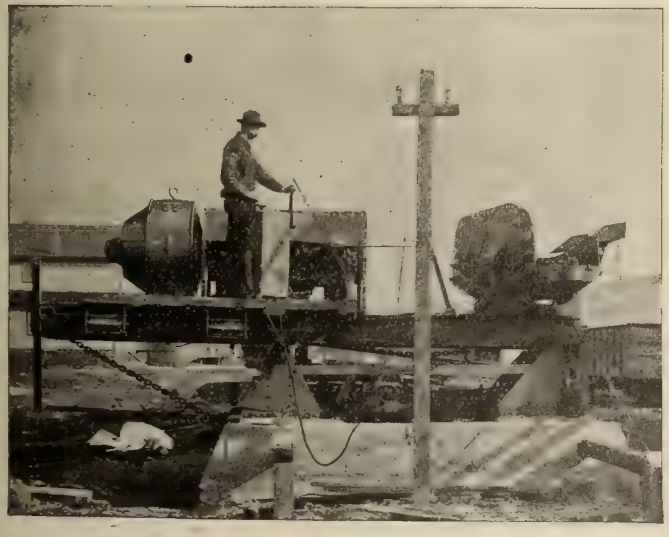
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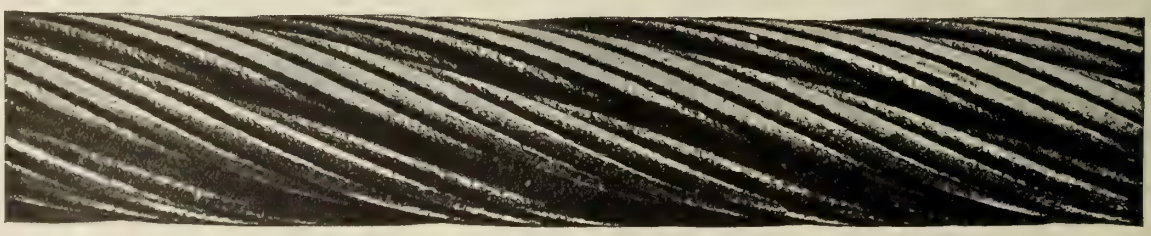


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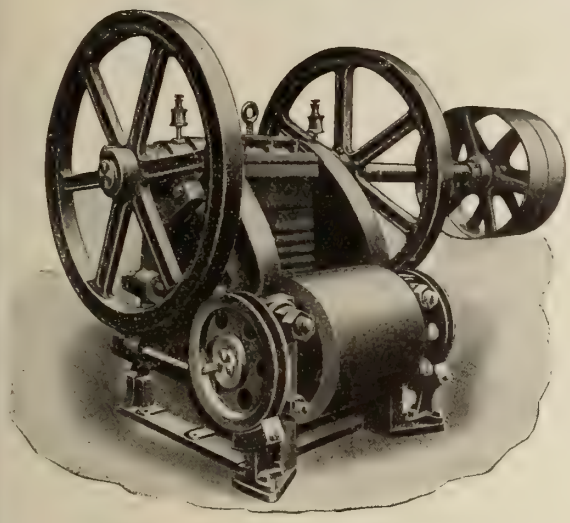
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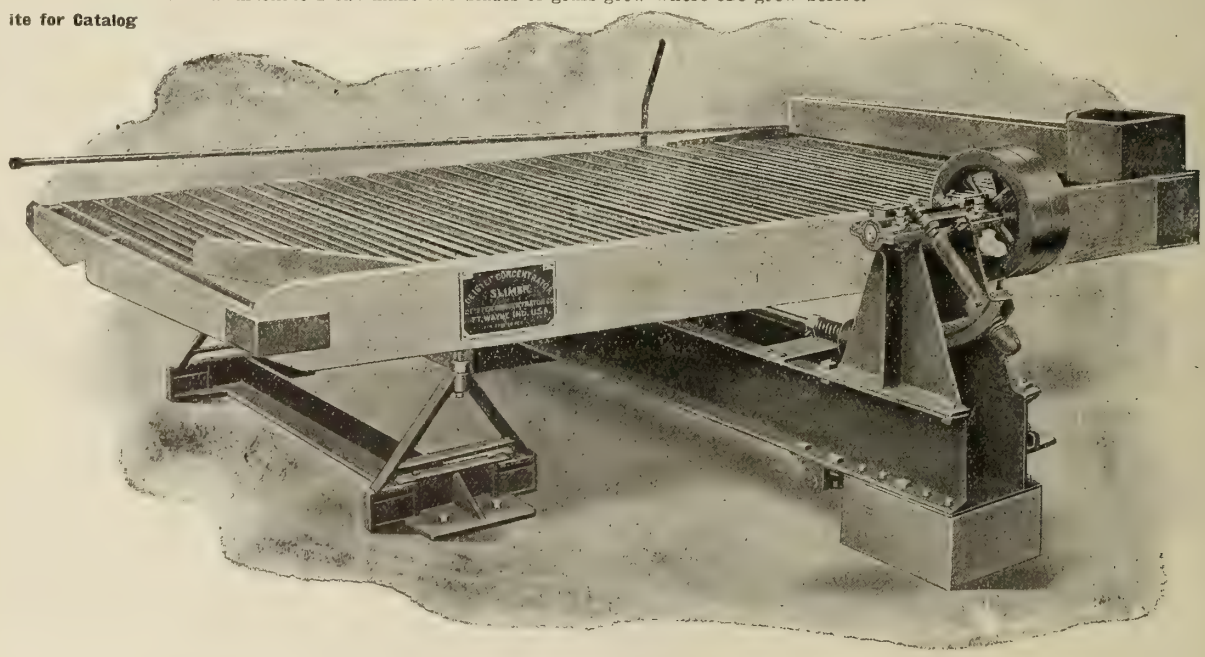
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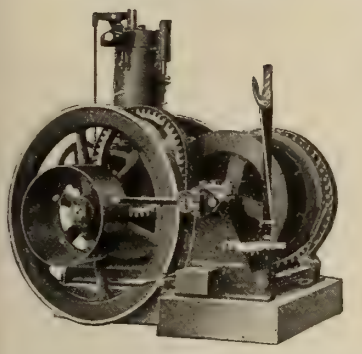
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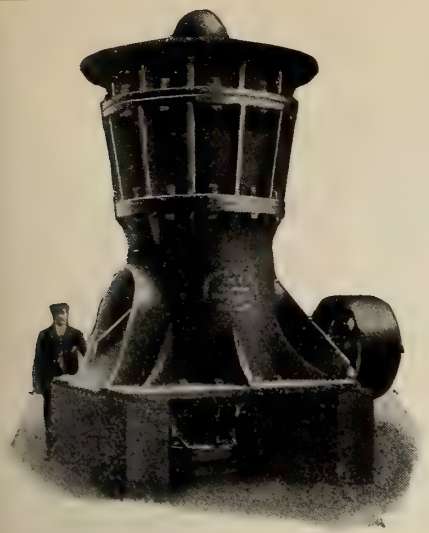
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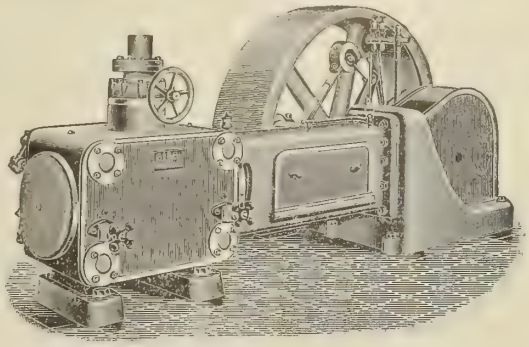
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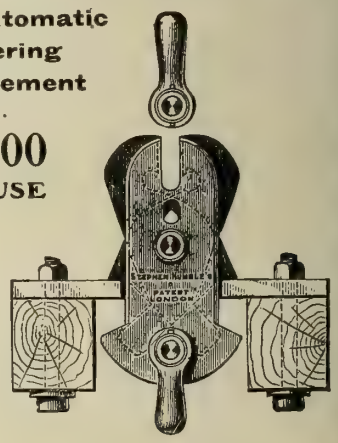
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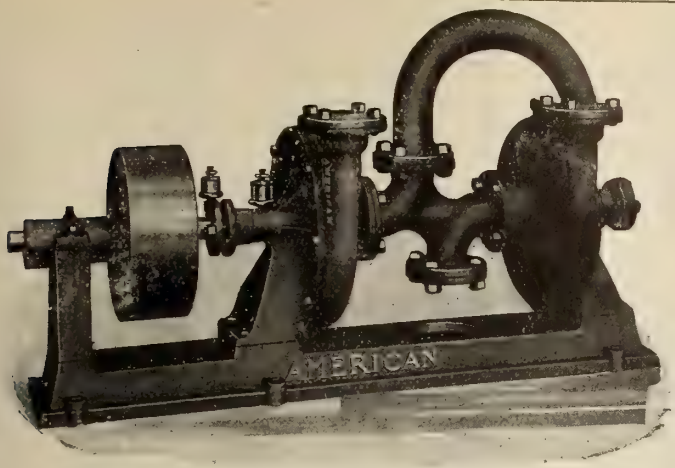
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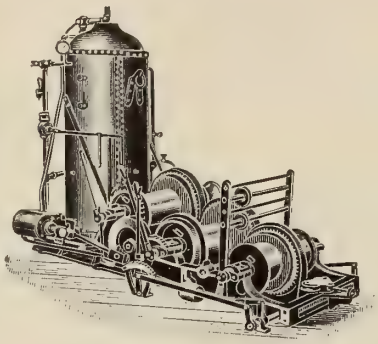
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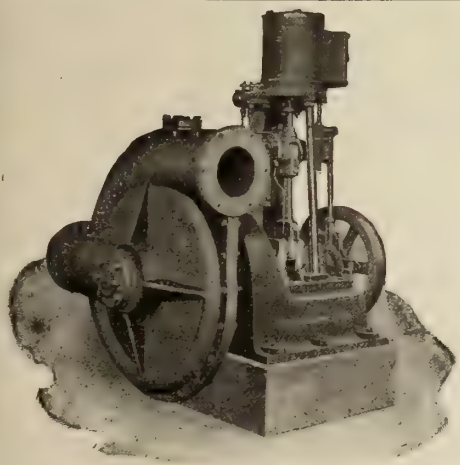
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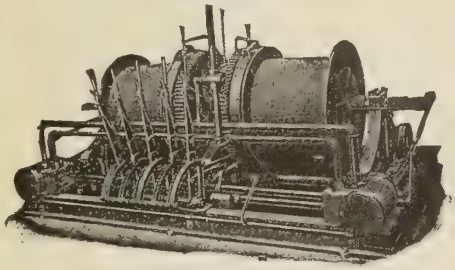
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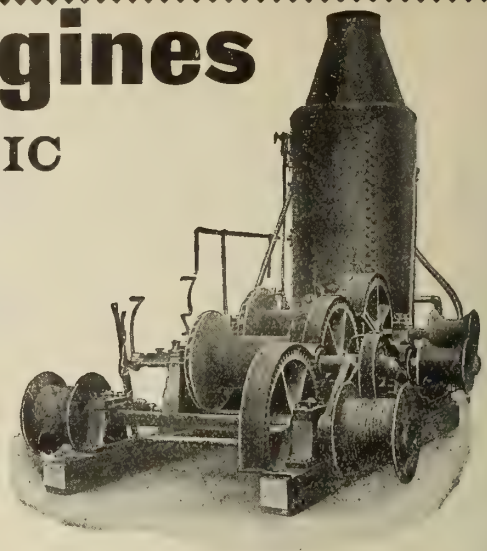
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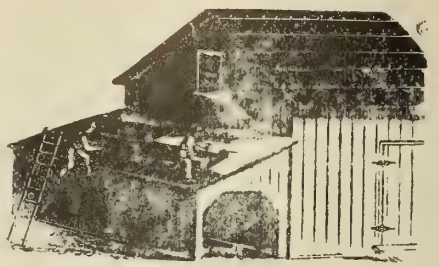
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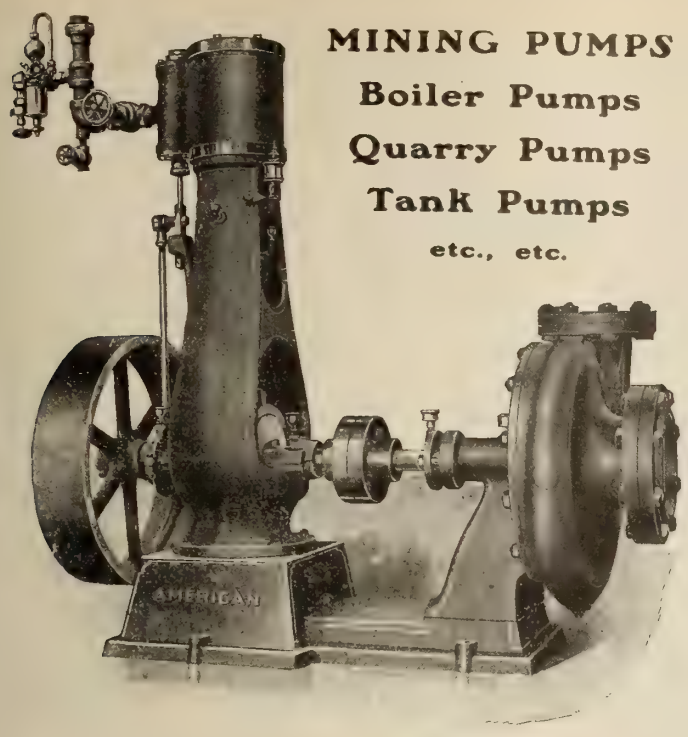
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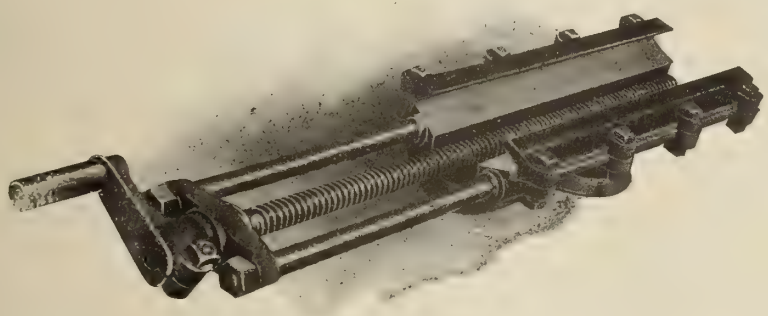
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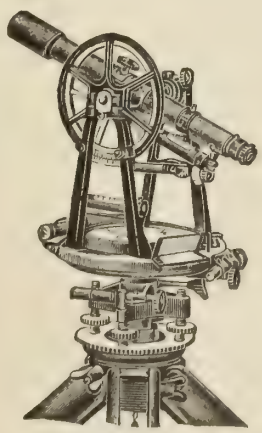
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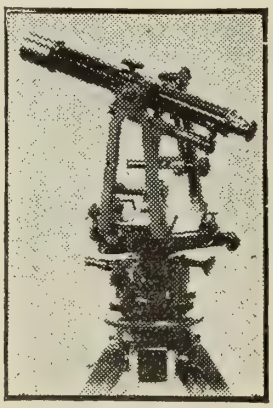
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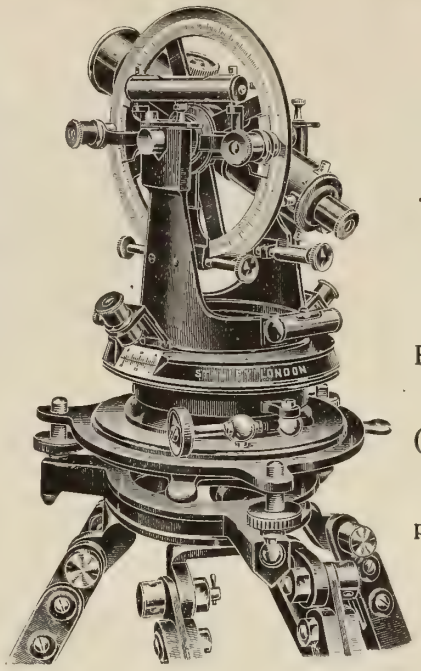
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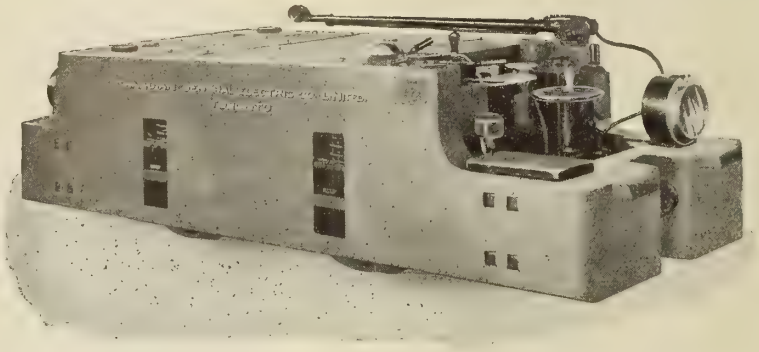
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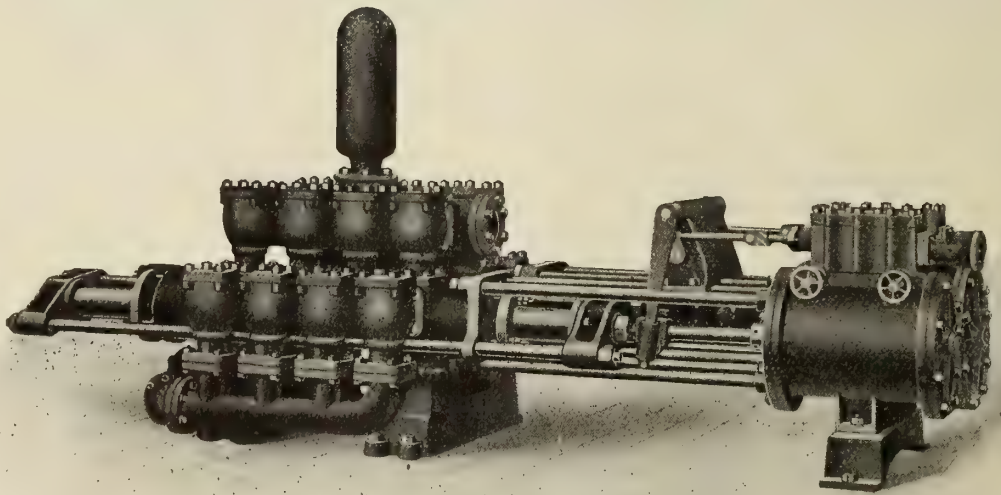
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FOLLY

The Canadian public is now being edified by the spectacle of two large corporations fighting out a quarrel in court. Until very recently it was hoped that the Dominion Iron & Steel Company's offer to settle the squabble out of court would have been accepted by its powerful antagonist. But the proffered good offices of would-be mediators were rejected and litigation was resorted to.

It is patent to all those who have followed the history of the Dominion Iron & Steel Company, that it is unable to stand the enormous expenditure entailed by such a suit. Nothing but sheer desperation could have justified its Executive in seeking the arbitrament of the law. An adverse decision will assuredly cripple it for many years to come.

With the Dominion Coal Company the case is different. It is a rich and successful corporation. It can survive total defeat, but not without feeling it severely.

These considerations, however, have nothing to do with the equity of the case.

Some months ago, or even at the initial stage of the disagreement, it should have been, in all reason, quite possible to have arrived at a compromise satisfactory to both of the contending parties. But apparently the actual outbreak of hostilities was preluded by a series of petty personal encounters. In the preliminary interchange of ultimata, decorum and moderation were forgotten and the difference at once became dangerously akin to a personal quarrel. The subsequent course of events has not weakened this impression.

Here, then, we see two of Nova Scotia's most important industries, each the natural ally of the other, engaged in a costly and dangerous struggle, because two or more of the chief officers of each could not sacrifice their personal pride.

We have freely condemned the labour organizations when they have recklessly precipitated industrial warfare. In what terms shall we characterize the men whose lack of the spirit of good citizenship has made possible this lawsuit?

The Federal Government is elaborating legislation which will, when perfected by experience, largely dispense with strikes and lock-outs. If such legislation is necessary to protect the country, all the more necessary is a law which will prevent the owners of public utilities, the operators of subsidized industries, from indulging in internecine war at the expense of the community.

We still pray that, even at the eleventh hour, the feud will be patched up. It is a hopeful sign that one of the litigants has voluntarily offered to submit the matter to any disinterested referee.

Thousands of dollars have been absolutely wasted,

worse than wasted, in proving and disproving a speculative geological point, in establishing and denying the metallurgical value of a certain class of coal. If money is so readily available for these futile purposes, why should not equal amounts have been long ago directed into construction and expansion?

THE ALBERTA COAL COMMISSION AND THE BRITISH EIGHT-HOUR BILL.

Recognizing the imminent danger of a recurrence in the West of last winter's coal famine, the Alberta Provincial Government appointed a commission to inquire into the conditions of the production and marketing of coal and to make recommendations as to the necessary measures for the prevention of fuel-shortages in the future. The report of the commission has been handed in. The salient points are as follows:

1. That the government endeavour to induce individuals and companies to store coal during the summer for use in winter, and to keep a reserve supply on hand.

2. That legislation be passed in regard to the erection and licensing of storage warehouses, which would enable agents and dealers to purchase and store coal during the summer.

3. That the necessary measures be adopted to compel railways to furnish cars for the prompt handling of coal. The principle of reciprocal demurrage is recommended in the event of other means failing.

4. That where mine operators experience difficulty in securing the construction of sidings, each case should be investigated, and if the construction be practicable, the Provincial Government should join the operator in presenting his case to the Railway Commission.

Having dealt thus with the question of fuel supply and transportation, the commission makes certain other recommendations for the improvement of the conditions of the miners. Principal among these are:

That the inspection of the ventilating equipments be more rigid.

That the erection of bath-houses for the use of the miners be made compulsory.

That the minimum age of employees be sixteen years.

That the distance between openings to a mine be not less than one hundred feet.

That provision be made for the rapid and cheap settlement of questions of damages.

Upon the "eight-hour day," the commission's report does not touch. It is stated that the Provincial Minister of Works has promised the introduction of legislation making the eight-hour day compulsory.

The commission has done well to avoid a definitive expression of opinion upon the "eight-hour" problem. The experiment of such a working day is presently to be tried in England. The Albertan Government will lose nothing if it defers action until the result of the British experiment can be noted.

The government "Eight Hours" Bill, which was introduced into the British House of Commons on August 1st, date on, only the eight-hour day, bank to bank, is to be makes legal the nine-hour day for eighteen months, from January 1st, 1908, to June 30th, 1909. From the latter permitted. The shift will be measured from when the first man leaves the surface until the first man comes to the surface, and from the last man down until the last man up. Limiting clauses are inserted, providing for an extension of the day in times of war or of industrial stringency. For this purpose the Ministers of the Crown are clothed with discretionary powers. The bill will not become law until next session. The full text will be found on another page.

A PERSECUTED PRESIDENT

The University of Toronto's newly appointed President has undergone a trial so severe, so dangerous and so soul-disturbing, that if he survives without permanent injuries he is a fortunate man.

Nova Scotians are not temperamentally demonstrative. This fact makes their outburst of appreciation (adulation, we had almost written) all the more remarkable. They have feted and feasted Dr. Falconer. They have told him, in language calculated to induce abnormal cephalic expansion in the ordinary or garden variety of man, that in his own proper person he embodies all the cardinal virtues, most of the graces, and a large slice of human culture and knowledge. Dr. Falconer is, however, a modest man. When the early morning brings its cooler counsels, he will realize that it were suicidal to attempt to live up to Nova Scotia's seraphic ideal. It will also dawn upon him that no ordinarily sinful professor could afford to be associated with such a flawless paragon.

However and however, we hope—we know—that the new President has limitations, even weaknesses, not mentioned in the specifications used by Nova Scotia when she so fervently set about constructing her ideal Falconer. We know that Dr. Falconer is a cool-headed, strong, kindly and cultivated man. Already he has done most valuable work in educational spheres. His influence has been profoundly felt in the Presbyterian Church. With the help of his Toronto confreres, success is assured him.

We find ourselves falling constantly into the irritating habit of giving advice—a dangerous thing for all concerned. But, nevertheless, we cannot refrain from exhorting President Falconer to keep a paternal eye upon his Department of Mining Engineering. So far as we are concerned, he may slight Exegesis, he may neglect Church History, Hebrew he may delete, Dogma may fall into innocuous desuetude—not a murmur will be heard from us. But the everlasting principles of smelting, the mutable practice of mining, the mysteries of mineralogy, the divine dubieties of geology, the sempiternal canons of chemistry, must never be overlooked.

THE WEST—ITS FUEL SUPPLY.

Experience teaches—but governments learn more slowly than individuals. During last winter the Western Provinces hung for months on the perilous brink of a fuel famine. Newspaper reports gave harrowing details of privation and suffering. Often these stories were exaggerated. Sometimes they were untrue. But there is ample evidence that throughout the whole Canadian West the fuel shortage was seriously felt.

Indications are not lacking that the approaching cold season will bring with it conditions similar to those of last winter. Labor troubles, transportation difficulties, a rapidly increasing population, and the demands of expanding industries make the danger of a fuel famine more than possible. But even were the possibility of a coal shortage remote, and not, as we have reason to believe it to be, imminent, it would be only prudent for the Federal and Provincial Governments to take very precaution against a recurrence of such a condition of affairs as obtained last winter.

The railroads are busily safeguarding their own fuel supplies. They should be, and must be, held accountable if, through negligence or through inefficiency, they are unable to meet the reasonable demands of the people. But the volume and continuity of the fuel supply is as completely dependent upon the miners themselves as upon any other factor. A strike can work more havoc than the indifference or inability of all the railway systems together. The right to strike, when the comfort, nay, the lives, of thousands of human beings, and the welfare of an enormous commonwealth may be imperilled, may well be controlled by the Federal authorities.

It may here be remarked that, so far, the Lemieux Act has been a negative, rather than a positive, blessing. To give it greater efficacy, revision and additions are necessary. It is now hardly more than a tentative attempt at practical arbitration. In principle it is sound; in practice it appears somewhat weak. It may become necessary for the Dominion Government to amend the Act radically. If, however, hot-headed operators and contumacious workmen are set upon quarreling, the final remedy is government ownership and operation of the coal mines. Meanwhile, the Western fuel situation must be met. The responsibility of meeting it rests primarily upon the government and the railroads.

EDITORIAL NOTES

Talc and soapstone have been steadily increasing in value during the past decade. Hastings County, Ontario, has the only large producing mine in Canada.

The importation of sulphur into the United States has decreased by over fifty per cent. in the last three years. In 1900 the exported sulphur from Sicily to the United States stood at 162,505 tons. In 1906 this had fallen to 41,283 tons. Meanwhile there has been a steady growth in the consumption, importation and production of pyrite. This movement is of great significance to the holders of pyrite properties in Canada.

SOME REFLECTIONS ON SECRECY IN THE ARTS.

Dr. James Douglas

(Continued from August 15)

Faraday's mind was too absorbed in wonderment and almost religious fervor as the secrets of nature revealed themselves, to be captious, and to waste his energies in defining exactly what he had done, or in defending his discoveries and great conceptions from supposed infringement by other scholars. He never forgot, despite his wonderful original work, that generally the great investigators only lay the keystone in the arch which many less gifted workers have been erecting stone by stone. He did not consider it any detraction from his honor that he merely crowned the structure, but had not built it from the foundation. In fact, they are the greatest among the great who appreciate this limitation and recognize what they are to others. It is they who enjoy the beatitude of the meek, for in the highest sense they inherit the earth, seeing that they are endowed by the Creator with some feeble insight into the very secrets of earth and heaven. They know that these secrets are but the laws and phenomena of nature, which we through our ignorance and prejudice are slow in understanding, but which would soon cease to be secrets, if we could only disabuse our minds of false conceptions, and see facts as facts instead of as arguments for our theories.

Faraday felt, as every true disciple of science should feel, that when we penetrate to the discovery of even the least important of the facts of nature, we are unveiling one of God's gifts to humanity, and if so, we have no right to draw the curtain over it and conceal it again from God's children in order that we may make money out of it. Looked at from this point of view, may we not question the right to buy men's thoughts, and when through their thoughts we have unravelled some of nature's secrets, and learnt something to our profit, use our power to impose secrecy? Are we not enslaving a human mind, and can any slavery be worse? A natural phenomenon or force, one so understood that it can be controlled, is it not as much a gift of God as rain and sunlight and therefore part of the heritage of all mankind? Corporate wealth and corporate energy are doing much for mankind, despite the fact that of corporate shortcomings we hear just now more than we do of corporate benefactions. But corporate influence will have reached its most beneficent development when the wealth and activity and masterful management of the able men who wield it are united to the knowledge and skill of their technical staff, in not only discovering but

publishing the truths of nature, which they may be agents in discovering. Nor are we over-sanguine in believing that this high aspiration if carried into practice would not interfere with the lower motive of their existence—money-making.

Nor is Sir Michael Faraday the only scientific worker in the field of practical science who has given the results of his labor unreservedly to the world. It is almost invidious to single out instances when so many distinguished men and such a multitude of obscure toilers are working at the intricate problems of technology from sheer attachment to truth and without any thought of gain. But three notable names may be mentioned, as representative of this noble army of the unselfish, our own Prof. Henry, Dr. Roentgen, and that devoted couple, whom we rank as one, for they as husband and wife were as devotedly in love of one another as they were one in love of science—Mons. and Madame Curie. The Roentgen Ray may have needed no patents, or patentable devices, or any business organization to push its beneficial applications, especially in the alleviation of suffering humanity, but it would not have been difficult to concoct patents had Dr. Roentgen, before describing his discoveries, wished to make money out of them.

And could the practical resources of radial activity be measured by dollars, what a fortune the bereaved widow would reap! But Prof. Roentgen enjoys a better harvest than royalties, and Madame Curie would not exchange for a mountain of gold the world's admiration and its reverence for her husband's memory.

But to descend to a lower plane. If it is the fact that technical science has progressed of late with such unwonted speed through the co-operation of many workers, and that this co-operation has been made possible by the publication and exchange of ideas and experiences in the technical and scientific journals, would not our progress be even more rapid and thorough if all barriers of secrecy were broken down and every encouragement were given to our technical workers not only to describe in print and by conference their notions and their actual experiments? This is the attitude of some of our large concerns, but unfortunately it is not that of all. It is impossible to compare the efficiency of works whose gates are fast shut, and where obscurity and secrecy are imposed and practiced, with those to which free admission is granted and where freedom of information is encouraged. But the following reflections force themselves upon us in this connection. We know that very few technical papers issue from certain establishments, that on their officials silence is imposed, and that to these inquisitive visitors are politely but peremptorily refused admission. There are not many such, but they are and have been very successful. But suppose that in imitation of their practice and regulations, all were tempted to adopt it, and thus the same policy became universal, what a sudden paralysis of industry would follow. Our secretaries would find it difficult to fill even their shrunken volumes of transactions with papers worth printing; our students would have to content themselves with what antiquated learning their professors could supply them with, for there would be no more summer classes for practical work in mines, smelters and electrical factories, and the professors themselves would have to learn from old books. Every manufacturer and smelter would be obliged to bribe his neighbor's workmen and tempt away his neighbor's superintendents for information. As a result before long the very workers which now find it so profitable or think they do, to tap their friends' stock of knowledge and experience, and give nothing in return, would be driven in upon their own resources, and probably not then find them so complete as they imagine. Of course I am supposing an impossibility, because the spirit of intellectual freedom in our professions is too strong and too widespread to submit to such a tyranny and because before such darkness of ignorance had settled down on our great industries, the most pronounced advocates of secrecy would feel and acknowledge what the ultimate consequences of concealment are, and would become reformers. To-day they may have valuable secrets, as valuable as Sir Henry's method of making plate glass and bronze powder, and it may pay them to conceal them from their competitors, as long as they are admitted freely to their competitors' open shops, but even this is doubtful. For the spirit of secrecy is intimately allied with the spirit of suspicion and distrust, and the mind which is always suspecting is closed tight against the admission of liberal impressions. Being jealous of others, it is prejudiced against their suggestions, and correspondingly prejudiced in favor of its own preconceptions. Progress, therefore, ceases.

This is a temper of mind foreign to a new country like this, whose special industries have not been established long enough to wear grooves of rigid practice and sink into ruts of self-satisfied indifference. About the best correction we can apply to the growth of dry rot is the banishment of secrecy. A curious instance of its blighting influence is seen in some of the older, not the newer, industries of the old world. The iron and steel works of Europe have not kept pace with ours in size and production, but the ironmaster of Great Britain and Germany in coke-making and in blast furnace economies, and in steel-making processes, have been our teacher. Nor have they been shy of communicating their improvements, nor through jealousy of our success, slow in adopting ours. No nobler monument of international comity exists than the seventy volumes of the Proceedings of the Iron and Steel Institute. And with few exceptions the iron and steel works of England, Scotland and Germany and France are open to any accredited worker in the same domain. But before England was conspicuous as a maker of iron, she was famous the world over for her copper and tin production. But what between self-conceit and the inbred habits of trade secrecy, her copper smelting industry has fallen from its high estate. And it is not accidental, but linked as closely as any effect with its cause, that this decline is in great part the result of habits of secrecy which grew with the growth of age. At Swansea every gate to the smelting works is guarded, and as a result it has been difficult for thought to escape out as for suggestions to find their way in. She should still enjoy the prominence which her skilled labor, splendid coal and commanding maritime situation put within her reach, but she has preferred clinging to her secrets behind closed doors rather than going out into the world in search of new business as well as technical methods, and inviting the world to enter and exchange ideas. And that notwithstanding that the first practical application of electrolysis to metals was made in England by Elkinton, and that the Vivians adopted the Manhes method before Farrel introduced it into this country. But what feeble use they have made of these great improvements. The Atlantic separates continents, but it does not delimit the operation of laws. And therefore what is baneful in its effects in Europe is not likely to be beneficial here.

In political life vitality is maintained only when every man takes his full share as a debater in the dis-

cussion of political questions, and as a voter in the determination of state affairs. So in scientific and technical matters, the banishment of deceit, mystery and jealousy, and the freest admission of daylight through the most unreserved diffusion of information, through the press and by personal intercourse, will instill into the whole body of workers a feeling of healthy rivalry which, while stimulating their mental activity, will correspondingly benefit the financial interests of their employers.

I have supposed an extreme case—that the example set by our few secretive establishments is followed by all. Let me imagine a more probable issue, which I believe such a fellowship of knowledge and experience as Mr. Carnegie asks the United States Engineering Societies to cultivate by presenting us with our home in Thirty-ninth street, will bring about, viz., that it will come to be appreciated by all our technical manufacturers that they will gain and not lose by encouraging their technical staff to study their neighbor's methods and throwing open their establishments to the free criticism of their competitors in trade. What will result? Nothing but gain, I believe, to all whose wisdom and means have enabled them to provide themselves with the raw material of manufacture on advantageous terms and to locate their works or factories at localities favorable for economical operation. Loss only to those who in any case should go out of business because they have failed to secure the conditions essential to success. But above all, advantage to the public, which after all is the finality we should always keep in view. How can these two conditions—financial success and public approval—be best attained. Unquestionably by mutual help and the most unreserved publicity. Take any branch of industry. No intelligent worker in that branch claims that he and his staff have attained either the utmost economy in operation or thorough acquaintance with all the reactions which enter into the processes which he practices. He knows that there are hundreds of others, intelligent and well-informed, all eagerly at work on the solution of the same problem. Some may be a little cleverer than others, and some may have made a little more progress in certain lines than their co-workers. But this discrepancy will not necessarily continue, for the clever fellow is picked up by rival works, and the secret so carefully guarded leaks out, and therefore the disturbed average of paid ability and of the stock of knowledge is restored.

As I have said—with certain reservations, and by special permission—many of our larger establishments in all or certain departments are freely open to each other's technical officers; but instead of being admitted by sufferance, they should be invited in with full liberty to study processes and test machines, for assuredly the host would benefit as much as the guests from the discussion which would follow such unreserved exchange of ideas and comparisons of appliances and methods.

I have also referred to certain limitations to publicity. One undoubtedly is costs. Under our present economic system, no manufacturer or miner or metallurgist cares to give away his costs, and that for very obvious reasons. What they are may be inferred, but professional courtesy forbids direct inquiry into that delicate subject. This restriction, however, need not interfere with unstinted technical freedom of intercourse. There is, moreover, another judicious limitation to publicity. Most of our largest concerns are incorporated and financed as joint stock organizations, in which thousands of technically ignorant and helpless shareholders are interested, and unquestionably indiscriminate admission to works and mines must be refused, for unfortunately there are visitors who, if admitted, after the visit would tell remarkable stories, from actual observation, with the view to affect the value of stocks. But such restrictions do not affect the main proposition that mercantile concerns of every class depending for success on technical knowledge and skill would gain by the removal of restraint on their technical staff.

I am not blind to the fact that the same object is sought to be attained by the consolidation of many works under one organization, or by the encouragement of friendly financial co-operation among even competing companies; but this tendency to consolidation has not yet succeeded in obliterating competition and will not as long as there are active, intelligent men in our midst who prefer to rule rather to be ruled, and to manage their own business rather than have it managed for them.

On the benefits or disadvantages of the present movement towards consolidation of works and the combination of capital in large industrial undertakings there is, and will be of course, considerable diversity of opinion. That competition is wasteful and is encumbered with other evils few will deny, that it has a keenly stimulating effect all will admit. Yet it remains to be determined whether a board of absentee managers and paid officials will be a compensating substitute for the ambitions, personal pride and tireless energy and skill of the individuals who have built up great works which they may have seen perhaps reluctantly absorbed into the combination. But one dangerous tendency will almost inevitably creep in. The larger the combination grows, the more sensitive will the management be, lest business and trade secrets be revealed by subordinate officers. The imposition therefore of strict rules of silence on all except those in supreme command is likely to result. If the absorption of any one class of our national resources should pass under the control of any one organization, the technical knowledge necessary to the development of this particular resource would be of interest to that organization alone, and the risks of publicity, and therefore the evils of secrecy, would become a merely academic question. Under our present undeveloped system this dangerous point probably will not be reached, for state socialism, to which concentration steadily approaches, would be the inevitable alternative and would be adopted before the other alternative had been attained. But it must be to the management of those enormous consolidations a grave consideration how they can give such latitude to the members of their staff as will produce that healthy self-reliance which comes from freedom of speech and freedom of opinion without endangering the tremendous financial interests for which they are responsible. But public opinion has been consulted and placated and therefore would it not be safer and better for the interests of their shareholders to adopt the policy of freedom which I have outlined? For the growing public anxiety, amounting to animosity and suspicion against our big corporations would be allayed if it was apparent that the technical officials of the small concern had at least the right of knowing what the big concern was doing, and the big official did not arrogate to himself the possession of exclusive knowledge and exclusive skill. From the point of view of public policy, the question is one well worthy of consideration, for it is coming about that not only railroads, as public highways, but all large corporations utilizing the country's natural products and converting them into necessary objects of trade, will pass under closer legislative scrut-

iny and public criticism in the future than they have in the past.

Unquestionably dangers can be foreseen as arising out of these great industrial aggregations—not only of capital but of industrial energy—dangers technical, social and political. There are also great possibilities of good. One of the benefits may justly be claimed to reside in the large funds that are available for and are devoted to technical research, and from which the public secures benefit indirectly—even when the results are not published. But if we could banish secrecy; and every industrial establishment of any magnitude, which is in its own interest carrying on technical research, should encourage its technical staff to confer freely with the members of every other technical staff, would not the sciences and are progress far more rapidly than if even one large organization should control any one industry? All our principal metallurgical and chemical concerns have laboratories, and carry on investigations and make experiments, generally on a large working scale, and therefore is not the advancement of science and technology better attained in a number of such laboratories than if there were fewer or only one? There is keener competition of wits when many brains are working independently. The friction of honest, active rivalry is a force not to be despised. The stimulus of ambition, and the still higher stimulus of love of truth, is sure to be stronger when men are free and not impelled by purely sordid motives. The air in such laboratories is freer and purer than where men are working under the stifling atmosphere of secrecy. I believe that such consolidation of mind and high motives would carry us further and faster along the road of human progress than all the trusts could appropriate for the advancement of technical knowledge.

WESTPHALIAN COLLIERIES

Impressions of a two days' visit.

(By Our Special Correspondent.)

Illustrations used with permission of the publishers of "Gluckauf."

The amount of actual data that it is possible to collect in a two days' visit is small, but the general impressions of a cis-atlantic miner on his first visit to the Westphalian coalfield, may interest the readers of THE CANADIAN MINING JOURNAL, if only from a point of view of comparison with mining methods on this side.

The busiest portion of the Westphalian coalfield lies within the triangle made by the cities of Düsseldorf, Cologne and Dortmund on the western shores of the Rhine. In this comparatively small section is to be found a very numerous and thriving industrial population engaged in coal mining, iron and steel making, and all the various subsidiary industries to be found in connection with these staples. The district includes the town of Bochum, with its famous Mining School, Essen, with its enormous Krupp Works, and the towns of Gelsenkirchen, Herne and Crefeld. Unlike so many coalfields, owing to the fact that the coal measures are overlaid largely by alluvial beds deposited by Father Rhine, the land is a fat one, and the farms and gardens encroach almost on to the colliery grounds. The Westphalians are a big and jovial race, and stoutly maintain that there is no country like their own, and no land where the "wine is so good, or the women so fair."

The mining industry of the Ruhr district is of comparatively modern development, its beginnings dating back only to the seventies. To-day, however, the Ruhr district supplies 60 per cent. of the total coal, which in 1906 was over 130,000,000 tons, exclusive of 56,000,000 tons of brown coal or lignite. Everywhere in Westphalia one is confronted by signs of an industrial prosperity and expansion that is almost amazing, even to one accustomed to the way they do things in Canada.

After the obvious newness and growth of the mining industry, one is impressed by the extraordinarily lavish expenditure made by the colliery companies on their surface erections and layouts generally. The word "extraordinary" is used advisedly, and the conditions must be seen to be realized. Even when one is actually on the ground one has a distinct feeling of unreality, and feels as though the whole thing were a "fairy tale." To a person accustomed to the strictly utilitarian policy and the careful expenditure of American and English coal operators, the methods of the German coal owners are astounding, to put the case mildly.

The ability of the German collieries to make such large expenditure is largely due to the huge coal trust known as the Rhenish Westphalian Coal Syndicate,



Head Office—Rheinelbe.

which corporation absolutely controls the Ruhr market. This syndicate controls 80 companies, and in 1906 produced 76,631,431, or 90 per cent. of the total output of the Ruhr district. The policy of its directorate is to allocate at the beginning of each year to each colliery under its control a given output. It operates to the fullest possible extent such collieries as are profitable to work, and reduces the output of the less profitable collieries to a minimum, compensating them according to a fixed sliding scale rate. The operations of the trust have resulted in large profits for the syndicated col-

lieries, and its policy is never cheese-paring where results are anticipated.

The natural conditions under which coal is mined in Westphalia are by no means so easy as obtain on this side of the water, and we should not attempt to work seams such as are very generally and profitably worked in many European mines. A large number of the German seams are steep, and the mining methods pursued necessitate a great deal of cross measure drifting, ladderways, chutes, etc., expensive features that we are not very much bothered with in this continent of big coal seams. The seams are mostly thin, and some of them exceedingly dirty and "brassy."

The generally dirty and impure conditions of German coals has caused the Germans to become pioneers in coal-washing, and their product is washed and sorted for the market with great care. In some of the collieries there the whole run of mine output goes directly from the pit mouth into the washer.



View of Zollern Colliery No, 2, Sbowing Main Entrance.

A typical Westphalian colliery is Zollern II., one of the mines of the Gelsenkirchen Company. The illustrations accompanying are reproduced by permission of the editors of *Glückauf*, the leading mining journal in Germany, and they will convey some idea of the elaborateness of German layouts. Referring to the large photograph of Zollern II. in detail (see Fig. 1), in the centre will be noticed the general executive office, the inside of which is no less elaborate than the outside. To the right hand is the main drawing shaft, with its fine steel headgear and the shelter roof over the pulleys. This headgear is typical of those found all through Westphalia. The whole of the right wing is under one roof, which includes the shaft also. The wing consists of a storehouse for small materials, lamp room, "lohnhalle" or pay hall, and a wash house (waschkaue). The latter is a feature of all Westphalian collieries, and one rarely sees a dirty workman on the public streets. The lohnhalle is a lofty and roomy building, which can be heated if required. It is used as a waiting room generally, where the workmen are protected from the weather at meal times, pay days and shift changing. A door opens from this hall into the wash house. This is a huge building with concrete floor provided with runnels and grates for the waste water. The walls are tiled, and the place is well lighted. There are 75 shower baths, provided with hot and cold water, so arranged that the temperature of the shower can be adjusted to please the user. Depending from the roof are numerous cords, counterbalanced, and passing over pulleys in the roof. On coming to work the miner divests himself of his clean clothes, lets down his pit garb, which has been suspended in a current of hot air near the roof since his last shift, and hoists his clean clothes in their places. After dressing he obtains his lamp from the lamp house, and any materials or tools he requires from the store room. Then he proceeds to the shaft, never being exposed to the weather after he enters the hall. Similarly, returning from work he is not liable to catch cold in his heated condition. He goes directly to the wash house, where he speedily cleanses himself, thanks to the strong pressure of the warm shower bath. He dries himself on the benches provided for this purpose and goes out of the colliery grounds fully dressed. The workmen provide their own soap and towels, and are required to take home their pit clothes for cleansing at stated intervals. The wash house is free from any objectionable odor, and is kept very clean. A separate bathing place is provided for boys under the age of eighteen.

The left wing contains the colliery shops, and near them are the stables and the fire station, where horses and fire fighting appliances are kept in instant readiness. Behind the air shaft, which is connected with the main drawing shaft by an overhead trestle of rather ornamental design, is the closet convenience, which has been adopted at all German collieries since the spread of ankylostomiasis. Thanks to sanitary measures of this kind, to the wash houses and the underground closets provided, not only is ankylostomiasis on the decrease, but other contagious diseases, such as miners' opthalmia, are less prevalent.

The "maschinenhalle" is distinctive of Westphalian collieries, all the more important machinery of the colliery being assembled in one large building of an expensive and very often artistic design and treatment.

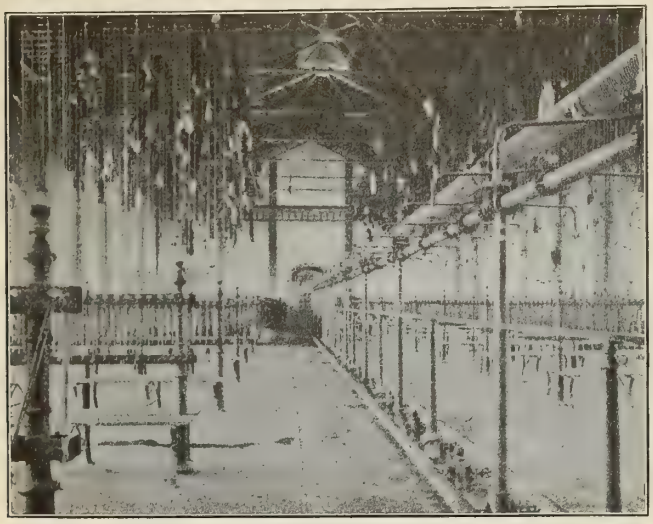
At Zollern II., the "maschinenhalle" has a floor space of 2,000 square yards, and contains the following machinery:—Three duplicate triple expansion horizontal steam engines, with direct coupled direct current dynamos. Only one of these units is in use at one time, the engines run at 90 revolutions, the flywheel is 20 feet diameter, weighing 32 tons, and the horse-power is 1,500 normal, 1,950 maximum. The generators are 500 volts, normal 1,100 and maximum 1,450 kw. The most important piece of machinery that derives its power from these generators is the winding engine, built by Siemens & Halske, for hoisting by the Koepe system. An Ilgner compensating or equalizing set is a feature of this winding installation, and it is said to obviate to a very marked extent the fluctuation in the load which is a principal objection to electric winding in deep shafts. The Ilgner machine at Zollern consists of a 300 h.p. direct current motor and a direct current dynamo, lying on either side of a massive cast steel flywheel 12 feet in diameter and weighing 40 tons, all three rotating with a common axle. The motor is fed from the main transmission and its voltage is kept constant at 500 volts. The power for

the winding motor is generated by the dynamo on the other side of the flywheel. The enormous energy stored up in the massive flywheel is used to help the engine over the peak of the load, while keeping the drain on the main transmission at an almost constant figure. It is the intention of the management to duplicate the present winding engine, and space has been reserved for this in the "maschinenhalle."

In the middle of the building are two electrically driven air compressors. Each compressor will deliver 2,300 cubic feet of air per minute at 130 revolutions.

The colliery is lighted from the main transmission by two transformers, situated near the compressors.

As may be seen from the illustrations, the building is worthy of the machinery. The floor and walls are tiled throughout, the windows are of stained glass, and everything is in keeping. The entrance to the "maschinenhalle" was designed by a prominent architect, and to one accustomed to more sober methods nothing could be less like a colliery engine house than this elaborate erection. But after all, is there not some justification for the German viewpoint? When the writer expressed his astonishment at one of these "maschinenhalles" to a German engineer, this gentleman said: "What does it matter when you spend $1,000,000 in machinery if you spend a few hundreds to make it look nice?" He said his experience had shown that the workmen respected themselves more and looked to their machinery with more zeal and care than when it was housed in poor and cheap buildings. When entering some of these buildings the writer found himself unconsciously taking off his hat.



Interior of Wash House.

The remainder of the Zollern layout calls for no particular mention. The fans are electrically driven, and give 210,000 cubic feet of air at 192 revolutions and 4 inch w. g. There is the usual washery, and retort oven plant with by-product recovery plant. One might mention that there is no noticeable effluvia from the sulphate houses at these recovery plants, and as may be seen from the illustrations it is possible to farm in their immediate vicinity.

The Zollern plant is designed for an output of 2,000 tons a day with a force of 2,000 men. To Canadian ideas this is a small yield per man, but it is not possible to institute an exact comparison in this respect, as our seams are so much thicker and easier to work.

The above description, though necessarily very incomplete in a general article of this kind, is typical of most of the collieries controlled by the syndicate.

Over and above the elaboration of the strictly productive part of the German colliery plants, one is impressed by the attention that is devoted to the prevention of accidents and what might be termed the humanitarianism of their policy, as evinced by the rescue stations, hospitals, etc., that one sees everywhere.

At the Shamrock colliery, Herne, we were shown over the accident room. The chief director at Shamrock is Herr G. A. Meyer, the gentlemen who led the Westphalian rescue corps at the Courrieres explosion. Herr Meyer is well known in mining circles, both in his own country and in England, and has always taken a great interest in every form of life-saving apparatus. He is himself the patentee of the "Shamrock" apparatus which was used at Courrières. We were shown over the accident room by the colliery policeman, a very stout and genial person in full military uniform, who was most anxious we should understand everything, and was evidently an enthusiast in his work. The room is entirely tiled with glazed white tiles, both floor and walls, and is adequately lighted. It contains three large baths, fitted with the most modern plumbing devices for washing and spraying, and an operating and bandaging table. A small crane runs along the roof with a two-way motion, so that the stretcher depending from it can be placed in any desired position. By an arrangement of strips forming the stretcher proper an injured man can be transferred from the mine stretcher with the minimum of motion. He can then be suspended over the bath, and washed, then moved over to the bandaging table and splinted as desired, and finally deposited in the ambulance, all with the least possible jarring or movement that would be likely to cause pain to an injured man. We were told that our policeman friend was such an expert in bandaging that the doctors never or rarely found it necessary to remove his bandages on the admission of the patient.

The place was almost ostentatiously clean, everything white and shining. Cupboards along the walls contained all necessary antiseptics, elastic and other bandages, special wire splints for specific injuries, restoratives, wines and spirits, surgical instruments, etc. One felt that everything possible was provided for injured workmen, and that nothing was left undone for their comfort. The place would be a credit to any metropolitan hospital.

Our correspondent also visited the Rheinelbe collieries, at Gelsenkirchen (see illustration). This colliery is possibly more elaborate than Zollern, as it is newer. It is one of sixteen collieries belonging to the Gelsenkirchener Bergwerks Aktien Gesellschaft.

Here we saw the "feuerwacht" or fire station. This building is better equipped than the fire station of many cities. We inspected first of all the rescue station, which consisted of a room fitted with several score breathing apparatus. Along the corridor was posted up the names of the members of the corps that were detailed for duty that day, should occasion arise. Connected with this room was a practising gallery, arrranged to represent as nearly as possible underground conditions, which could be filled with noxious gases, enabling men to practise the wearing of breathing apparatus under conditions as nearly as possible actual. The practising gallerying is fitted with windows by which the work of those practising can be watched from the corridor.

Outside the rescue station we saw a fully equipped diver practising in a huge tank filled with water. He had three men in uniform to attend to his air supply.

Then we saw the fire station proper, and our corres-

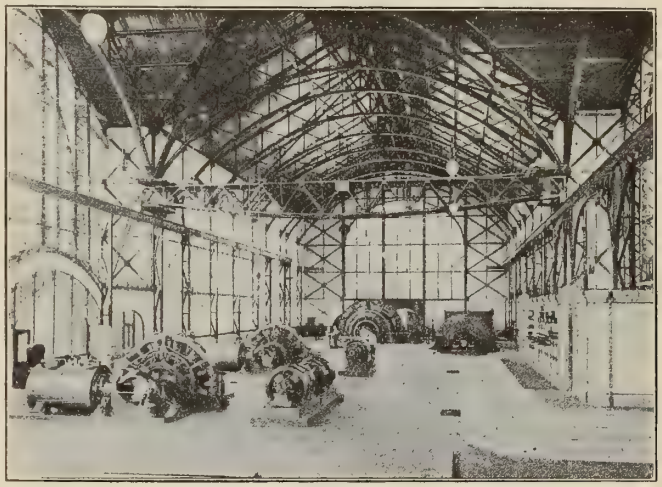
pondent was the first person from Canada to sign the visitors' book, a circumstance that necessitated considerable drinking of healths. In the fire station office were all sorts of electric alarms, telephones, tickers and tape machines, communicating with all parts of the Rheinelbe colliery itself above and below ground, and with the town of Gelsenkirchen and the other collieries of the district. The equipment of the station comprises a fine fire engine, chemical engine, hose reels, ladder cart, etc. The stable held eight horses, two in constant readiness. The firemen are always on duty and sleep on the premises. The superintendent, a very courteous young German in full uniform, was showing us round when the alarm rang in from Gelsenkirchen, and although our presence was a hindrance, the brigade turned out in thirty-four seconds.

This fire department is maintained entirely by the Colliery Company itself, and is duplicated at every colliery of this particular corporation. In the case of a colliery fire or explosion the united brigades of a district turn out, as they did at the Reden explosion, where over 180 trained men equipped with breathing apparatus and various rescue appliances responded to the alarm.

The Gelsenkirchen Company are also very careful of the welfare of their workpeople. All the houses have large gardens and are well built of stone and brick. The officials' houses are three storey buildings, the equivalent of a $30 or $35 Canadian house rented by the month. They also have large gardens fully enclosed. The company provide also an infant school for the children of their workpeople, hospital and recreation grounds. The officials have their casino, where wines and beer are sold and billiards and other amusements provided. The average wage of the workmen employed by this company is M. 4.36 per shift, and about M. 1,300 per year. The company employs over 21,000 men, and raise annually about five and one-half million tons. With all their elaborate layouts they pay dividends of from 12 per cent. to 15 per cent.

There is no lack of amusement around the collieries, the "Theatre" and "Bierhalle" being much frequented, as are also the various mining schools and lectures. Teetotalers are unknown in Westphalia, and indeed the existence of such being is regarded there with some incredulity. How differently two nationalities may regard the same subject may be gathered from a remark overheard by the writer when seated in the official casino at Rheinelbe colliery. After clinking glasses all round with about a dozen of the officials of this colliery, and giving to each the orthodox greeting of "Prosit," we discussed the customs of our two races, and one of our guides was at much pains to explain to his compatriots that "der Herr" drank no wine in his own country, and that in Canada it was quite possible to refrain from drinking with one's friends, and "yet be respected." And this statement evoked a pitying smile all around the table. Yet can it be said that there is less drunkenness around our Canadian mines than there is in Westphalia? From what we saw there drunkenness is rare indeed. With the German to drink is a normal daily habit, and he does not indulge in abnormal excesses.

The German colliery owners are quite as ready to scrap out-of-date machinery in order to adopt newer and better devices as our friends across the line. In the matter of economics in colliery consumption in particular, their policy is progressive. At most collieries, some, if not all, of the boilers are heated by superfluous gases from the coke ovens. Latterly great attention has been devoted to electric power generated by gas engines, fed by purified waste oven gases and gas producers. At Zollern exhaust steam turbines are being used with marked economy. Recently when considering the provision of more power, it was found that there was available for the purpose of driving an exhaust steam turbine about 35,000 pounds of exhaust steam, coming from a compound fan engine with 22 inch cylinders, and two compound winding engines having 36 inch and 51 inch cylinders respectively. This exhaust now actuates a turbine connected to a 900 kw. dynamo. The result of a recent test reported in *Glückauf* gave figures as follows:—Amp. 596, volts 1,121, kw. 1,112, with an expenditure of steam per kilowatt hour of 31.6 pounds. This was of course in conjunction with a central condensing plant. Condensing plants are to be found at practically all the Westphalian collieries. With coke oven gas fired boilers and condensing plants there is very little smoke or steam around these collieries.



Interior of Power House.

Our correspondent met with every courtesy during his short visit. Although everybody was exceedingly busy, yet at every colliery someone was found who devoted his whole attention to us while we were there. It was rarely that we did not find somebody who would speak English, and the linguistic abilities of the German engineers is surprising when one considers how severe have been their studies along purely technical lines. We saw evidences everywhere of the high technical education of the mining community generally, both officials and workmen. The excellence of German technical education is, however, such an admitted fact that it is unnecessary to enlarge upon it here. A very striking feature of the collieries is their general neat and tidy appearance. They looked all of them as though the Board of Directors were expected at any time to make inspection. The workmen also were neatly and sensibly garbed, and of good physique. How much of this is due to their military training would be an interesting question. On enquiring whether the military service required of every man affected adversely the industrial situation we were answered with a smile, and assured that its effect was quite otherwise, and that much of the present industrial success of the German people is to be attributed to the habits of order and discipline inculcated by military life. Certainly discilpline and order seem to be the first considerations in any German works. Perhaps, to Canadian ideas, they push these ideals too prominently into the foreground, but results have been obtained, and there are quite a few things to learn over in the Fatherland.

ANKYLOSTOMIASIS

"Miner's Anemia."

By F. W. Gray.

(Continued from August 15)

Westphalia.

Ankylostomiasis has been known to exist in the mines of Westphalia since 1886, and during the years 1892 to 1895 enquiries were being made at the instance of the German Department of Mines, but no further steps were at that time deemed necessary than the examination of foreign miners, more especially those who came from the brickfields of Gelgium, and a superficial examination of the underground employes for facial signs of anemia at the various mines by a medical officer as the men filed past on pay days. That there was no reason for alarm will be gathered from the figures following. Up to 1899 these show a steady decrease in the number of cases, but it will be noted that a very rapid rise took place in 1900:—

1898—107 cases in 16 mines, equals 6.4 per 10,000.
1897—113 cases in 32 mines equals 6.2 per 10,000.
1898—99 cases in 24 mines equals 4.9 per 10,000.
1899—94 cases in 27 mines equals 4.4 per 10,000.
1900—275 cases in 42 mines equals 11.7 per 10,000.
1901—1,030 cases in 65 mines equals 40.6 per 10,000.
1902—1,355 cases in 69 mines equals 52.9 per 10,000 (first 9 months only).

It is very generally admitted that the introduction by the Government in the early part of 1900 of compulsory water sprinkling in all dusty and fiery mines explains to a very large extent this suddent increase in the extent of the infection. The object of the sprinkling order was to lessen the danger of fire and dust explosions, which in the past had caused the loss of many lives, and this object was achieved. The order was very thoroughly carried out, pipes being laid all over the mines, provided at convenient distances with spraying nozzles which distributed water in the form of a fine dust. Before and after every shot the working places were sprayed most effectively, and the whole mine was filled with moisture. Some persons deny that the sprinkling order was altogether responsible for the sudden increase, but their exact coincidence is at least significant. The majority of the coal seams in Westphalia have a very high pitch, and one result of spraying was that the surplus water flowed back into the levels, carrying with it in a diluted state portions of any fecal matter with which it came into contact. Dr. Tenholt (the Chief Medical Officer of the Knappschafts-Verein), stated before the Berlin Conference of 1903 his belief that the increase in the number of cases was due to the sprinkling, which diluted and distributed the faces and acted as a vehicle to carry the ova to every part of the mine, besides providing the moisture so necessary for the development of the larva from the egg. Further, the surplus water in many instances drained into a central sump, and was used over again for sprinkling, with the result that the eggs and larvae were distributed broadcast over the mine, thoroughly infecting it in every part.

The oversight and general responsibility for the general health of the miners of Westphalia is vested in the hands of a body known as the Knappschafts-Verein, which is a compulsory provident society under Government supervision. It is supported by contributions from the miners and by grants from the coal operators, and has its own medical officers. At the urgent request of the coal operators, who were justly alarmed at the serious spread of the infection, this body in 1902 appointed a special Commission, who have since been actively engaged in fighting the disease. They formulated rules and inaugurated a vigorous compaign of education and prevention. The use of sump water in sprinkling was forbidden, and arrangements were made for extended medical examinations of the personnel at the infected collieries. Up to the time when the Commission took over the general direction of the measures adopted for the extirpation of the infection, the medical examinations, as before mentioned, had been made on pay days and were very superficial. Such persons as the eye of the doctor picked out as showing anemic symptoms were sent to the hospital for examination and treatment. It began, however, to be realized that this procedure was not sufficiently far-reaching, and that while the distinction between "worm-sick" and "worm-carriers" was absolutely correct from a clinical point of view, the worm-carrier, even though apparently healthy, was a focus of infection, and a menace to the health of those who worked with him. The Board of Mines at Dortmund issued an order calling upon the coal owners to arrange for a miscroscopical examination of the faces of at least 20 per cent. of the underground force, and where infection was known to exist or was revealed by this partial examination the faeces of every person employed underground were to be separately examined. By this means it was hoped to obtain an exact knowledge of the extent of the infection. One of the many difficulties to be overcome was the provision of a sufficient number of examiners, as owing to the similarity between the eggs of the ankylostome and those of other intestinal worms a special training was necessary before the miscroscopists became expert, and it was further found that 50 slides a day was all that one man could examine, owing to the very exacting nature of the work. It is hardly necessary to enlarge on the elaborate organization and apparatus required, and the enormous amount of not over-pleasant work that this task involved, but the results obtained fully justified the undertaking. Official figures, given in "Gluckauf" in November, 1903, showed that out of a total of 188,730 men in the Dortmund district 17,161 or 9.09 per cent. were the victims of ankylostome infection, the percentage of infected men to the total employed underground ranging at different collieries from 2 per cent. to 28 per cent.

In order to afford these men proper treatment portable hospitals were provided by the Knappschafts-Verein at the various collieries. To these hospitals were sent all those men whose dejecta contained worm eggs. They were put through a course of treatment with extract of male fern, and about 97 per cent. have been discharged from the hospital as cured. Before being allowed to resume work underground these men must hold a certificate that they are worm-free, and present themselves for another examination within six weeks. In a

small percentage of the cases treated—1.5 per cent.—the extract of male fern has failed to drive out all the worms, and as further doses might endanger the health of the men they are discharged "uncured," and not being allowed to work underground must find surface employment.

Adequate closet accommodation underground is enjoined by law on all mine owners. The closets are usually iron pails, strongly made with tightly fitting lids, and often fitted with ingenious arrangements to prevent the soiling of the seat. Any man who defecates in the mine and does not use the closet provided, is, if discovered, sent to prison without the option of a fine. The pails are looked after and kept clean by men specially detailed to do this work. In the night time these men collect and load the pails on to special trucks, on which they are despatched to the surface, where the pails are emptied, washed out with hot water, and finally sterilized in a steam cylinder before being sent down below ground again. At some Westphalian collieries the management have provided water closets of a rather elaborate nature on the surface for the use of the employes before descending the mine. This commendable innovation has been found to work satisfactorily in practice, and is becoming more general.

Numerous attempts have been made to disinfect the mines by the use of such substances as lime, carbolic acid, permanganate of potash, sulphuric acid, etc., but without success. The disinfection of a mine whose various roadways total up to perhaps one hundred miles is obviously impracticable, not only on the score of the cost, but because in order to be effective the disinfectant must be applied at least daily. Further, the encapsulated larva is very difficult to kill, and can live for twenty-four hours in a 1 in 500 solution of corrosive sublimate. Those substances would effectively kill the eggs and larvae are mostly inadmissible in the confined airways of a mine on account of their corrosive nature, and their strong odor, and it being finally realized that attempts to disinfect the roadways of a mine were quite fruitless the idea was abandoned entirely, all efforts being concentrated on the prevention of the entrance of new infection.

Thanks to the severe measures adopted and the energy displayed in their promulgation, the Westphalian epidemic has now been got into very manageable limits, and will be steadily stamped out, although it will be probably several years before it can be regarded as extirpated. Probably in no other country could such drastic laws be enforced as were passed in Germany in regard to this disease. Considerable dissatisfaction was aroused among the miners, whose freedom was restricted by the necessary measures taken to limit the infection by preventing men from moving round from one colliery to physically from the disease. The "Kur" was an unanother, who also suffered pecuniarily and not a little pleasant ordeal, and several hot discussions took place between the Social Democratic side of the House and the Government benches with regard to the methods of the doctors and the Knappschafts-Verein. The Government were fortunate in being able to avail themselves of the organization of the Knappschafts-Verein, on whom indeed the bulk of the work fell. The cost of each single cure averaged about 80 marks, and the Knappschaft expended something like three millions of marks. But how effective the measures were may be judged from the fact that the number of worm-carriers has been reduced from 18,000 at the end of 1903 to 2,500 at the beginning of 1905, and it was hoped by the end of 1905 to have reduced the number to nothing. What the actual monetary loss due to the epidemic amounts to it is impossible to say, but when the loss in output of coal and in wages is added to the amount spent on hospitals, relief funds, medical equipment and sanitary arrangements, the total must necessarily be a very large one. The sum of three million marks mentioned as having been spent by the Knappschaft does not include the private outlay of the coal companies, which, in the case of some of the larger concerns, has exceeded a quarter of a million of marks.

Belgium.

Cases of ankylostomiasis were reported in 1884, and in 1885 several men were found to be infected who had worked in the St. Gothard Tunnel. From 1884 to 1898 ninety-two cases were treated in the Liege Hospital. More cases becoming known, steps were taken in 1898 by the president of the Medical Commission at Liege to determine the extent of the infection by a miscroscopical investigation, to decide on preventive measures and to endeavor to educate the workpeople by means of lectures and literature. The Commission immediately ran up against the fact that they had no authority to demand assistance in their work or samples of dejecta for microscopical examination, and in most cases no facilities were extended to them, either by the coal owners or the workpeople. The Commission then issued literature warning the miners against the grave results that followed unsanitary habits underground, and requested that the men should not leave their excretions in the mines, but both their warnings and requests were ignored. In spite of this lack of encouragement, however, the Commission were able to examine 15 per cent. to 20 per cent. of the underground workmen at 72 collieries. Of these collieries 49 were found to be infested and 23 immune. In some of the mines the infection was very severe, going as high as 75 per cent. of the underground force. The Belgian Government have taken practically no action, being afraid of the opposition of the miners and their Socialistic leaders. An attempt to introduce closets underground had to be abandoned in view of the determined resistance of the miners. The subject of ankylostomiasis was discussed at great length by the International Congress of Hygiene, which met at Brussels in 1903, and was attended by the most eminent medical authorities. Resolutions were adopted recommending various compulsory measures, but in view of the apathy of the mine owners and the ignorant opposition of the miners, little had been done at that time in this direction, a state of affairs in marked contrast to the strong action of the responsible authorities in the neighboring coal field of Westphalia.

At the present time, however, a much better condition exists in the Liege Basin, due almost altogether to the labors of the "Dispensaire du Mineurs," an organization that was created in 1903, and, largely under the direction of Dr. Malvoz, has steadily fought ankylostomiasis with gratifying results. The object of the dispensaries was first of all to protect the miner against ankylostomiasis, and for this purpose to educate him and his family in hygienic principles, to assist those who were sick, and to improve the sanitary conditions of the mines. The following table will give some idea of the work undertaken and accomplished by Dr. Malvoz and his colleagues in the last four years.

	1903	1904	1905	1906	Total
Ankylostomiasis treated in the dispensaries.	210	806	1,324	1,573	3,903
Microscopical examinations of dejecta ..	1,570	10,840	21,088	22,188	55,706

The number of "worm-carriers" has also fallen from 27 per cent. in 1902 to 9 per cent. at the end of December, 1906, and it is thought that at the present time not more than 5 per cent. of the underground workers in the Liege Basin are infected.

No man, who under miscroscopital examination of his faeces was found to be a worm-carrier, was allowed to descend the pit until he had undergone successful treatment, and had been proved by at least three microscopical examinations spread over a certain period to be "worm-free." As in Westphalia, it was found necessary to remove from the mines all worm-carriers, who, although they might be in apparently good health, were yet disseminators of infection.

It is interesting to note that these microscopital examinations have proved that miners are particularly affected by intestinal worms, as not only ankylostome eggs, but the ova of oxyuris, ascaris, taenia and other intestinal parasites are found in great variety.

FRANCE.

In the French coal fields the disease has not assumed the aggravated form that it has taken in Westphalia and the Liege Basin, but it has probably been existent in a mild form for a long time. The peculiar anemia which manifested itself in 1802 at the Anzin mines is described in a monograph by Manouvriez, and there can be very little doubt from the exact correspondence of the symptoms that this anemia was due to ankylostomiasis. The rapid extension of the disease in the neighboring countries alarmed the French authorities, and in 1902 an official enquiry was instituted under the direction of Dr. Calmette. The work was divided into two sections, the first comprising the coal fields of the north and Pas-de-Calais, and the second the coal fields in the Loire Basin. At the beginning of 1905 sixty mines had been examined in the first named district, at thirty-two of which infected men were found. The proportion of worm-carriers was 1.8 per cent., 10 per cent. being exceeded in three mines only. The results of the enquiry in the Basin of the Loire are not as yet published, but the infection is more general than in the first district, the mines of which are comparatively cold and dry.

The labors of the two Commissions have met with ready assistance from the coal operators, and it is not probable the infection will be allowed to spread any further; the authorities being fully alive to the gravity of the situation.

(To be Continued)

The Industrial Advocate developes a suggestion made by Mr. A. A. Hayward regarding Government help in exploiting the gold mines of Nova Scotia. The Government's offer of a cash subsidy to encourage the sinking of deep shafts has not had the desired effect. Mr. Hayward has come forward with the proposal that the Government subsidize, not shaft-sinking, but cross-cutting. The idea is particularly applicable to the gold deposits of Nova Scotia. The Local Government may well give it more than "serious consideration."

THE MISCHIEF OF IT.

(LONDON LETTER)

To those engaged in the exploitation of Ontario's mineralized areas, the feeling of London is a matter of concern. Not that the aloofness of the city is irremediable. Not that Throgmorton and Lombard streets are irreconcilable, because of opportunities missed by default. Not that money is unavailable for meritorious ventures. To the contrary, there are funds awaiting supplicants, but in all my experience I have never observed so much indifference; and the cause is attributable to those who erred in their estimates of the extent of public credulity and receptivity.

London is a singular combination of recklessness and reserve. It has paid for its experience at the uttermost ends of the universe when it would have been more profitable to speculate within the colonial circle. Vast sums have been squandered, more have netted returns up to expectations, the reserves of to-day are very great indeed, underwriting and overwriting are as easy of accomplishment as ever; but mining is at a discount. Canada will have to dress its exhibits differently. Instead of printed pictures in the form of script, it is incumbent on all those engaged in developing Northern Ontario fields, to offer something more substantial than hypothetical prospectuses.

It may be somewhat immaterial that existing misconceptions arise out of studied misrepresentations said to emanate from those who would create a bargain counter period for Cobalt properites. This, with ill-advised and unwarranted attempts at promotion, undoubtedly has engendered distrust. None the less has it become urgently necessary for scientific men and technical journals to admonish Toronto miners and embryotic millionairies as to the folly of cheapening their projects, discrediting them in fact, by peddling paper at "job lot prices." Where there is proof of ore reserves or substantial prospects, capital can be provided, and it is the absence of this and the species of rough riding resorted to that causes financiers of the world's metropolis to prefer railroad and government issues, and very often industrial enterprises more risky than mining. Debentures carrying 4½ per cent. and offered at 93 or 94 are regarded with suspicion, while the same at 97 or 98 are absorbed with complacent avidity. Cobalt shares at a premium would require less formal introduction than if they were tendered away below parity, hence you have to reckon with those who malign your mining country and those who choose to discredit what already is discredited by its "clearance sales" prices.

A time will come when London will not be quite so skeptical. How soon will depend upon those who cater for the best buyers, not merely for those who seek a gamble. Unfortunately the fomenting of doubt has placed power in the hands of London journals identified with bucket-shops or worse, and this is a sample of the weekly paragraph of palpable purpose:

"Larder Central Gold Fields.—R. P. E. (Birmingham).—We thank you for the advertisement cutting of this Canadian wild cat from the Birmingham *Daily Mail*. We hope none of our readers will be induced to send money to Messrs. — 'Fiscal Agents—Bank, Toronto.' "

In all directions other than mining Canada's credit is gilt-edged. Cobalt's credit can be equally so—if.

ALEX. GRAY.

THE GENESIS OF THE COPPER DEPOSITS OF YERINGTON, NEVADA.

By E. P. Jennings, Salt Lake City, Utah.

(Toronto Meeting, 1907.)

The Yerington Copper Deposits in Lyon County, Nevada, 40 miles southeast of the famous Comstock Lode, present many interesting features, both from commercial and geological viewpoints.

The Mason Valley Mountains, in which the mines are located, are a small north-south range about 25 miles long and 3 to 6 miles wide, with a maximum elevation of 6,500 feet above sea level and 2,000 feet above the valley of the Walker River.

The core of this range is intrusive granite, exposed in the higher peaks and in the deeper canyons where the erosion has been greatest, but covered by metamorphosed sedimentary strata on both the eastern and western slopes. Late rhyolite flows occur along the eastern base of the mountain.

The intrusive granite is a coarse-grained mixture of feldspar, quartz, hornblende and biotite, becoming porphyritic in structure near the contacts.

Resting on this granite are beds of rock several hundred feet in thickness composed of the lime-alumina garnet, grossularite, graduating into andralite by the partial replacement of the alumina and lime by iron.

A partial analysis gave the folowing results:—

SiO_2	36.2
Fe_2O_3	27.2
Al_2O_3	12.7
CaO	22.7
MgO	.4

This rock varies in texture from a compact mass to a coarse crystalline aggregate of a cinnamon-brown color.

Thick beds of white to gray crystalline limestones cover portions of the garnet rock, but their original area has been greatly reduced by erosion.

An extensive series of metamorphic rocks also occur, whose greatest development is on the west side of the range, where they have a nearly vertical dip and a thickness of 3,000 feet. This series is unconformable with the garnet and limestone on the western slope and separated from them by a fault which has dropped this later series into its present position. These rocks are not as well developed on the eastern side and their relation to the garnet-lime series is obscure.

In composition they range from silicified limes to microscopic aggregates of tremolite, lime-silicates and biotite, and probably were lime shales and slates originally.

The eastern foot hills are covered by late flows of rhyolite that have no connection with the ore deposition.

The structure is complicated by a system of folding and faulting older than the granite intrusion, also by faulting after the mineralization. The effects of this faulting will be considered later.

Copper ore occurs in the garnet rock as an impregnation throughout portions of its mass and as richer concentrations in fractures and shear zones; also as bedded veins in the marbleized limestones.

The effect of the folding and fracturing of the strata previous to the granite intrusion has been to localize, in a degree, the deposition of the ore in the garnet rock along these fracture zones, giving the deposits the appearance of fissure veins filled with chalcopyrite disseminated in a garnet or garnet-epidote gangue, which has a laminated structure parallel to the boundaries of the fractured zone.

On either side of these fissures the garnet rock is more or less impregnated with chalcopyrite, but separated in some cases by a narrow rib of barren epidote 2 to 3 feet thick.

The lower boundary of the ore is the granite, as shown in the Bluestone Mine on the eastern side of the range, where the contact is well exposed; chalcopyrite in a garnet-epidote gangue resting directly on the barren intrusive rock.

The marbleized limestone, which, in places covers the garnet rock, contains bedded veins filled with oxidized copper ore in a quartz and calcite gangue.

At water level, which in one case occurs at a depth of 600 feet, pyrite and chalcopyrite begin to appear, replacing the oxidized ore.

The mines have not been sufficiently developed to show the relation of the ore in the limestone with the ore of the garnet shear zones, but that there is some connection is very probable.

The original minerals of the ore deposits are chalcopyrite and pyrite which have been oxidized and partly leached, forming in the upper enrichment zone, malachite, azurite and chrysocolla, and covellite as a coating, or chalcopyrite in the upper sulphide zone. Bornite and chalcocite occur as secondary sulphides in a few instances.

These ore occurrences can be classed as contact-metamorphic deposits, but differing from the ordinary type in which the ore occurs as iregular masses near the contact; this difference being due to the pre-existing fissures which confined the ore-bearing waters in channels of great vertical extent; aside from these local concentrations the garnet is impregnated with a low grade copper ore.

Where the fisures were more open they were filled by the molten magma, forming dikes of granite-porphyry.

As mentioned before, the mine developments are not of sufficient extent to connect the limestone ore bodies with those contained in the garnet, but it is difficult to avoid the conclusion that in depth the two classes of ore bodies will connect, forming a continuous lode, whose lower boundary is the granite and with its apex in the limestone.

If this view is confirmed by later work, the deposits will be of great interest as illustrating the genesis of ore bodies due to the action of intrusive rock masses, the magmatic waters of which have mineralized certain pre-existing fissures, and, together with the heat derived from the molten magma, have converted certain sedimentary beds into garnet rock containing more or less disseminated ore and other beds, in a higher horizon, into marble, and also filling fractures parallel to the bedding of this marbleized limestone with copper ore.

It is not possible at the present time to determine how much of the rock metamorphism is due to the heating effects of the intrusive and how much to the introduc-

tion of new compounds by the waters of the molten magma, but we can assume that the ore is due to these waters and that the rock metamorphism was largely caused by the action of heat, supplemented by the chemical action of the water, as the garnet is more or less impregnated with ore, showing its permeability to these solutions which undoubtedly contained other mineralizers that contributed to the formation of the garnet.

The limestones, which occur at a higher horizon, have probably been altered by the action of heat alone, as they contain no ore, except in the fissures.

The district is being developed rapidly; one mine having a million tons of ore in sight, and in two years' time it is expected to become a copper producer on a large scale.

THE BRITISH EIGHT-HOUR "BILL"

I.—(1) Subject to the provisions of this Act a workman shall not be below ground in a mine for the purpose of his work and of going to and from his work, or be allowed to be below ground for that purpose, for more than the time fixed by this section during any consecutive twenty-four hours.

(2) The time fixed by this section is, during the period beginning on the *commencement of this Act* and ending on the *thirtieth day of June, nineteen hundred and nine,* nine hours, and thereafter eight hours.

(3) No contravention of the foregoing provisions shall be deemed to take place:—(*a*) In the case of a workman working in a shift, if the period between the times at which the first workman in the shift leaves the surface and the first workman in the shift returns to the surface, and the period between the times at which the last workman in the shift leaves the surface and the last workman in the shift returns to the surface, do not exceed the time fixed by this section; or (*b*) in the case of any workman who is below ground for the purpose of rendering assistance in the event of accident, or for meeting any danger, or for dealing with any emergency or exceptional work which requires to be dealt with without interruption in order to avoid serious interference with ordinary work in the mine.

(4) The owner, agent, or manager of every mine shall fix for each shift of workmen in the mine the time at which the lowering of the men to the mine is to commence and to be completed, and the time at which the raising of the men from the mine is to commence and to be completed, in such a manner that every workman shall have the opportunity of returning to the surface without contravention of the foregoing provisions of this section, and shall post at the pit head a conspicuous notice of the times so fixed, and shall make all arrangements necessary for the observance of those times in lowering and raising the men.

(5) The interval between the times fixed for the commencement and for the completion of the lowering and raising of each shift of workmen to and from the mine shall be such time not exceeding the time reasonably required for the purpose, as may be approved by the inspector.

(6) A repairing shift of workmen may, notwithstanding the provisions of this section, for the purpose of avoiding work on Sunday, commence their period of work on Saturday before twenty-four hours have elapsed since the commencement of their last period of work, so long as at least eight hours have elapsed since the termination thereof.

(7) For the purpose of this Act, the expression "workman" means any person employed in a mine below ground, who is not an official of the mine or a furnace-man, onsetter, horsekeeper, or pumpman; and any body of workmen whose hours for beginning and terminating work in the mine are approximately the same shall be deemed to be a shift of workmen.

II.—(1) The owner, agent, or manager of every mine shall appoint persons to direct at the pit head the lowering and raising of men to and from the mine, and shall cause a register to be kept in the form prescribed by the Secretary of State, and containing the particulars prescribed by him with respect to the times at which men are lowered into and raised from the mine, and the cases in which any man is below ground for more than the time fixed by this Act, and the cause thereof.

(2) The workmen in a mine may, at their own cost, appoint and station one or more persons, whether holding the office of checkweigher or not, to be at the pit head at all times when workmen are to be lowered or raised, for the purpose of observing the times of lowering and raising, and the provisions of the Coal Mines Regulation Acts, 1887 to 1905, relating to the checkweigher, and to the relations of the owner, agent, or manager of the mine to the checkweigher, shall, so far as applicable, apply to any person so appointed as they apply to the checkweigher, with the substitution, as respects appointment, of the workmen in the mine for the persons who under those Acts are entitled to appoint a checkweigher.

(3) If any person makes a false entry in the register which is to be kept under this section, or causes or permits any such false entry to be made, he shall be liable on summary conviction in respect of each offence to a fine not exceeding five pounds.

III.—(1) The time fixed by this Act as the time during which the workmen in a mine may be below ground for the purpose of their work and of going to and from their work may be extended as respects any mine by the owner, agent, or manager of the mine, on not more than sixty days in any calendar year by not more than one hour a day, and on any day on which an extension of time is made in accordance with this section as respects any mine, the time as so extended shall be substituted for the purposes of this Act as respects that mine for the time as fixed by this Act.

(2) The owner, agent, or manager of every mine shall cause a register to be kept in such manner as the Secretary of State may direct of the cases in which any extension of time has been given under this section, and the register shall be open to inspection by the inspector.

IV. His Majesty may, in the event of war or of imminent national danger or great emergency, or in the event of any grave economic disturbance due to the demand for coal exceeding the supply available at the time, by Order in Council suspend the operation of this Act to such extent and for such period as may be named in the Order, either as respects all coal mines or any class of coal mines.

V. In the application of this Act to mines which are entered otherwise than by a shaft, and to workmen who are not lowered to or raised from the mine by means of machinery, the admission of men to the mine shall be substituted for the lowering of men to the mine, and the return of men from the mine shall be substituted for the raising of men from the mine, and such times as may be determined by the owner, agent, or manager of the mine, with the approval of the inspector, as the times properly corresponding to the times fixed for the commencement and completion of the lowering

and raising of workmen to and from the mine, shall be substituted for the times so fixed.

VI.—(1) If any person contravenes or fails to comply with or permits any person to contravene or fail to comply with any provision of this Act for which a special penalty is not provided, he shall be guilty of an offence against this Act, and in the event of such contravention or non-compliance by any person whomsoever, the owner, agent, or manager of the mine shall each be guilty of an offence under this Act. Provided that:—(*a*) In the event of any such contravention of or non-compliance on the part of a workman, the owner, agent, or manager of the mine shall not be guilty of an offence if he proves that he has taken all reasonable means to prevent the contravention or non-compliance; and (*b*) a workman shall not be guilty of an offence under this Act in the case of any failure to return to the surface within the time limited by this Act if he proves that without default on his part he was prevented from returning to the surface owing to means not being available for the purpose.

(2) A person guilty of an offence under this Act shall in respect of each offence be liable, on summary conviction, if he is the owner, agent, or manager of the mine, to a fine not exceeding two pounds, and in any other case to a fine not exceeding ten shillings.

(3) If a workman is below ground for a longer period during any consecutive twenty-four hours than the time fixed by this Act he shall be deemed to have been below ground in contravention of this Act unless the contrary is proved.

VII.—(1) This Act shall, except where the contrary intention appears, apply to all mines to which the Coal Mines Regulation Acts, 1887 to 1905, apply.

(2) This Act shall come into operation on the *first day of January, nineteen hundred and eight.*

(3) This Act may be cited as the Coal Mines Regulation Act, 1907, and shall be construed as one with the Coal Mines Regulation Acts, 1887 to 1905, and this Act and those Acts may be cited together as the Coal Mines Regulation Acts, 1887 to 1907.

NEW DEPARTMENT OF MINES.

Dr. Haanel's appointment to the Directorship.

By H. Mortimer-Lamb.

Brief reference was recently made in these columns to the Act of Parliament creating a Federal Department of Mines, under the direction of the Hon. Wm. Templeman as Minister, a gentleman who is keenly alive to the requirements of the industry. The establishment of this department, the need of which had for some years past been repeatedly brought to the attention of Government, is a matter for much congratulation, and the satisfaction generally expressed that the step has at length been taken is not less enthusiastic by reason of the fact that the actual administrative and executive work of the Department has been entrusted to men of exceptional ability and experience.

The qualities that eminently entitled Mr. A. P. Low to his appointment to the head of the Survey will serve him in equal stead in the performance of his new and more responsible duties as Deputy Minister. In this work, however, he will have the advantage of the strong support of a gentleman who for the past six years has not only made a special study of the development of methods for promoting the interests of mining in the Dominion, but during his tenure of office as Dominion Superintendent of Mines has already, by the economic value of the reports issued under his instruction and the importance of the research work in electro-metallurgy which he has inaugurated, done great service for the mineral industry of Canada. We refer, of course, to Dr. Eugene Haanel, whose appointment to the Directorship of Mines we chronicled recently.

Dr. Haanel was born in Breslau, the capital of Silesia, Germany, on May 24th, 1841, in which centre he received his early education, graduating from the Gymnasium, in the classical course in 1858. Shortly afterwards he paid his first visit to the United States. He saw service in the Civil War, of which he was a veteran, and after was elected to the Chair of Modern Languages in Adrian College at Adrian, Michigan. Subsequently he taught modern languages and philosophy at Hillsdale College.

In 1867, Dr. Haanel was elected Professor of Natural Sciences in Albion College. During his residence at this institution, a period of four years, he labored with characteristic energy and zeal for the improvement of his department of the University, with the result that before he left it had become the largest and most adequately equipped of the institution. While at Albion he received the degree of Master of Arts from Ohio University.

At the close of his fourth year at Albion Dr. Haanel finding his health very much impaired from over work returned to Germany, where he graduated from Breslau University as Doctor of Philosophy, with the degree "magna cum laude" in the following subjects: Geology, Mineralogy, Chemistry and Physics.

Immediately upon the completion of his university course, Dr. Haanel returned to America and joined the staff of Victoria University, Cobourg, Ontario, as Professor of Natural Sciences, and lecturing for the first six years on the subjects of Geology, Mineralogy, Chemistry and Physics, after which on the appointment of one of his students, Dr. A. P. Coleman, to the Chair of Geology in Victoria University, he confined his attention to Mineralogy and Physics only. Later he was appointed Dean of the Science Department and Director of Faraday Hall, the first Science Hall in Canada, the erection of which was carried on under Dr. Haanel's supervision and direction.

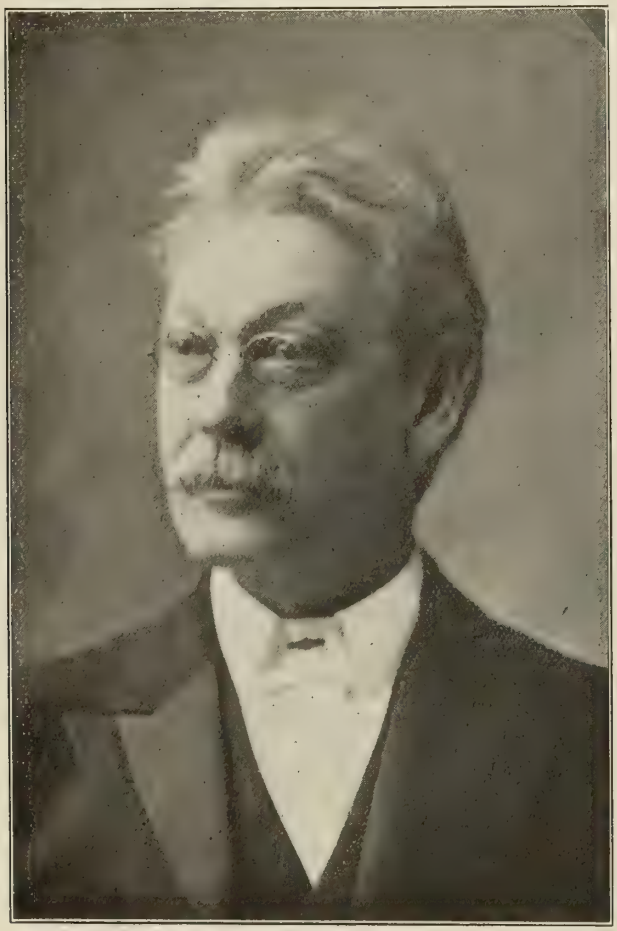
During the term of his professorship at Victoria University, Dr. Haanel found time to undertake some original research work in connection with blowpipe analysis, his results being printed in a series of papers entitled, "Hydriodic Acid as a Blow Pipe Reagent and Gypsum Tablets as a Support Superior to Charcoal," and published in the Transactions of the Royal Society of Canada, of which he was a charter member.

In 1888 Dr. Haanel was invited to accept the Chair of Physics in Syracuse University, and upon the removal of Victoria University to Toronto, accepted the

invitation in preference to a Professorship at Toronto University proffered at the same time. When he assumed his duties at this University, however, he found the equipment of the Department very inadequate, but ultimately with his aid it came to rank in this respect with the best provided institutions in the country.

In 1901 Dr. Haanel resigned his Professorship to accept the appointment of Superintendent of Mines for Canada, offered him by the Hon. Clifford Sifton, then Minister of the Interior, and also, by the way, a former student under Dr. Haanel.

Few men have won such regard and esteem from their associates as has the new Director of Mines. Thus on the subject of his Canadian appointment, the Syra-



Dr. Eugene Haanel.

cuse *Post-Standard* remarks in a leading article: "In choosing a scientist as Superintendent of Mines of the Dominion of Canada, no man more worthy from past record and present ability could have been selected. . . . In a tribute paid Dr. Haanel upon the conclusion of fourteen years of service as a Professor in Victoria University some years ago it was said that probably no other person had done so much to give science its due importance in the university education of Canada as this man. He entered Syracuse University twelve years ago when the Department of Physics was small and poorly equipped; he will leave the University in possession of one of the finest and most complete departments that can be found in any educational institution in the country." And the Chancellor of the University wrote: "I congratulate you and I congratulate the Government of Canada upon securing a man so eminent among scholars, so thoroughly filled with science and dominated by its genius and, who . . . adds to his scientific knowledge, acquaintance with mechanical arts and with affairs, an acquisition indispensable to the important office to which you have been appointed."

Upon coming to Canada Dr. Haanel proceeded at once to initiate a work of importance. The Klondike excitement was then in full swing and our energetic neighbors to the south were putting forth every effort to secure the bulk of the trade resulting therefrom. And they were succeeding largely by reason of the fact that there was a United States assay office at Seattle, where without any difficulty or trouble the miner might take his gold and convert it into currency without being heavily mulcted in charges. Hence the Superintendent of Mines established a Government Assay Office in Vancouver, and also arranged with the provincial authorities for like facilities at the capital, and in consequence the stream of gold was considerably diverted into Canadian channels.

His next important work was the production of the monograph "On the Location and Examination of Magnetic Ore Deposits by Magneto-metric Measurements." This method of locating magnetic ore bodies has been most successfully adopted in Sweden and it should prove of extraordinary value and utility in this country where the conditions are not dissimilar. We understand, meanwhile, that the instruments will be largely used for determining the extent of ore bodies by the engineers to whom has been entrusted the task of reporting for the Department on the iron resources of the Dominion.

Possibly, however, Dr. Haanel's greatest achievement from an economic standpoint is the work resulting from his investigations of the application of electro-thermic processes for the smelting of iron ores and steel as applied to conditions existing in Canada. In 1903 he was appointed Chairman of a Commission which went to Europe to enquire into the different processes in use there. A full and most valuable report giving the result of these investigations was published the following year and attracted widespread interest and attention, while later the Government authorized the setting up of an experimental plant at Sault Ste. Marie, where a series of very successful tests was carried out under the direction of Dr. Haanel in the autumn and winter of 1906, the results being published in the report recently issued. The future will determine the commercial potentialities of electric smelting in Canada, but in the opinion of many competent to express an opinion it will ultimately revolutionize existing methods and be the means of turning to profitable account the large iron resources of Ontario and Central Canada, which are now to all intents and purposes lying idle.

Among other important publications issued from the Superintendent of Mines' office may be mentioned, a report on "The Mining Conditions in the Yukon Territory" (1902); a report on the "Shales and Clays of Manitoba," and "Monographs on Mica and Asbestos," and the valuable report of the commission last year on zinc in British Columbia.

The programme for this year's work in connection with the new Department of Mines is of a very comprehensive nature and will include a Monograph on Canadian Graphite, a report on the Peat Industry of Europe with a view to affording information to Canadian producers; a report on Iron Ocurrences in Eastern Canada, and last, but not least, a manual of general information covering the field of mining endeavor in the Dominion and containing a directory of mining companies operating properties, descriptions of mining

and metallurgical plants and statistics of production and other useful data.

Dr. Haanel is a member of the following institutions: Physical Society, Canadian Royal Society, Canadian Mining Institute, Faraday Society, and North of England Institute of Mining and Mechanical Engineers.

It may be safely said, in conclusion, that under the direction of such men as Mr. A. P. Low and Dr. Haanel, the new Mines Department will speedily become of the greatest possible value to the industry. Since the Act passed there has ceased to be a danger, at one time imminent, of the duplication of effort arising from two departments of the Civil Service under dis-associated heads engaging in duties of a very similar nature and practically working to the same end. Meanwhile the office of the Mines' Department has been moved to the Thistle Building in Ottawa, pending the completion of the new Government buildings in which permanent quarters will be established. The original plans for this building were drawn by Dr. Haanel, but subsequently changed by the architect to conform with other requirements, such as space for the museum and National Picture Gallery. It is proposed nevertheless to devote ample room in the building for laboratory purposes, and suitable equipment is also to be provided for carrying on metallurgical tests and experiments on a considerable scale.

THE MINING AND METALLURGICAL LABORATORY

School of Mining, Kingston, Ontario.

G. J. McKay.

The School of Mining is a College of Applied Science and is affiliated with Queen's University, which confers the degrees on the graduates. Courses are given in Mining, Civil, Electrical, Mechanical and Sanitary Engineering, and in Geology, Minerology and Chemistry. Each course covers a period of four sessions.



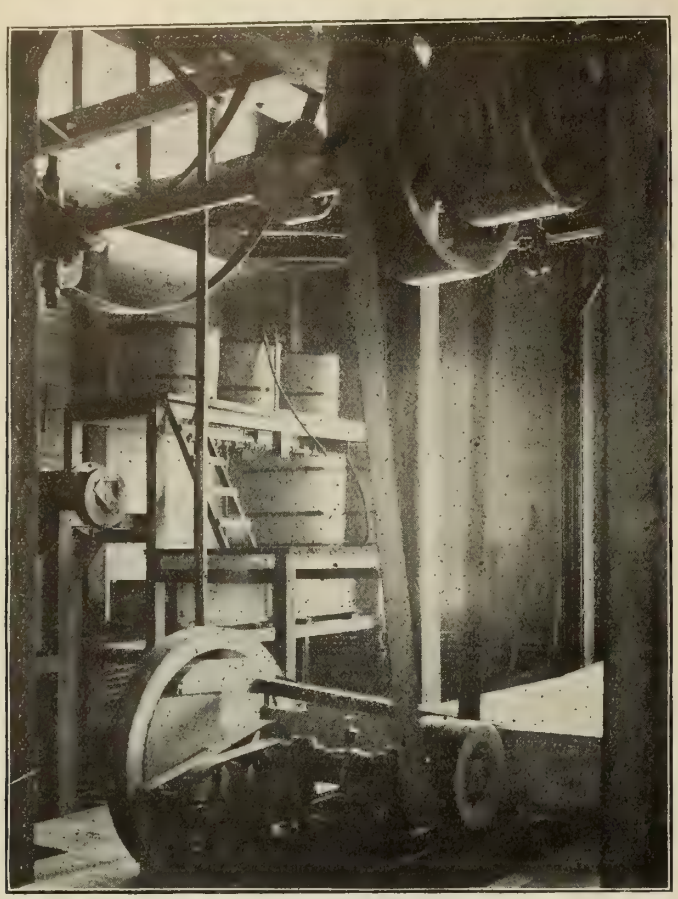
Mining Laboratory, Kingston School of Mining.

The oldest and best developed course in the School is that in Mining and Metallurgy. This department is under the direction of Prof. J. C. Gwillim, M.E., and Prof. S. F. Kirkpatrick, M.Sc., both graduate of McGill University, and men of wide experience in their respective departments.

The part of the School that is of most interest to mining men is the Mining and Metallurgy Laboratory. Visitors are surprised to see the amount of machinery and apparatus that is in use in this building. The milling and concentrating machinery is of the most approved pattern. A complete assay and chemical laboratory occupies part of the building, and is used in connection with the mill work only. Fourth year students in Mining and Metallurgy receive their practical training here.

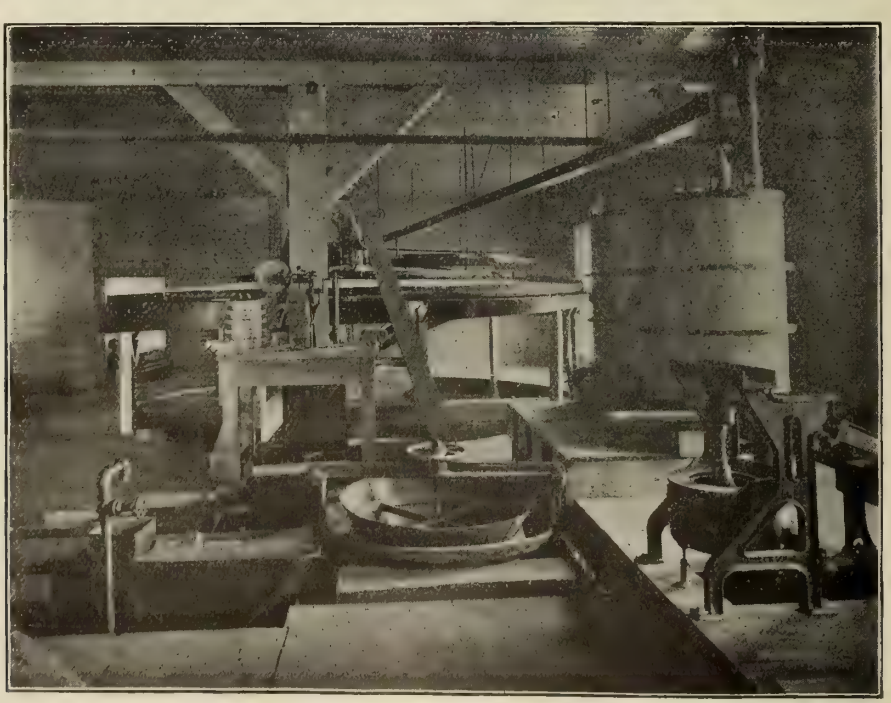
They are given practice in the treatment of gold and silver ores by stamp milling and amalgamation, cyaniding and chlorination; and the concentration of ores by the jig, the Frue Vanner, the Wilfley table, the slime table, and the magnetic separator.

During each session, up to the Christmas vacation, the work is confined to the treatment of gold and silver ores. The whole of each Friday and the morning of each Saturday are given up to this work entirely. Crushing, sizing, sampling and assaying are first practiced.



Wilfley Table and Cyanide Plant—Mining Laboratory.

A Blake crusher, a pair of rolls, a Krupp ball mill, a tube mill and a cone grinder are used for crushing and pulverizing the ores. Then mill runs are made on quantities of ore of a ton or more, and saving is made by amalgamation and by concentration of tailings on the Wilfley table, the tailings being caught and the slimes settled in spitzkasten and slime boxes. The concentrates are treated by different processes to find the best method of recovering the values, and the tailings and slimes are treated by chlorination or cyaniding. All this work is



Classifiers and Slime Table—Mining Laboratory.

checked by assays, and thorough laboratory cyaniding and chlorination tests always precede the treatment of tailings and slimes.

The plant for the gold and silver runs consists of a five stamp battery of 850 pound stamps, with mortar and apron amalgamation plates, a Wilfley table, a Frue Vanner, a Spitzkasten, slime boxes, a silver amalgamation pan and settler, and a complete cyaniding outfit. During last session two mill runs of Larder Lake ore were made, and a ton of refractory Temagami ore was treated.

The work during the last half of the session is confined to the concentration of different kinds of ore on the jigs, Wilfley table, Frue Vanner, etc. Last session quartz-copper ores, zinc-lead ores and magnetic iron ores were experimented with. Assays were made to find what size and what method of treatment gave the best results in each case. For large runs, besides the concentrates already mentioned, a Colorado Iron Works classifier, an Evans jig and a Hartz jig are used.

In the Metallurgical department complete analyses of smelting ores are made, charges are calculated, and small furnace runs are put through. For this purpose there is a small blast furnace and two reverboratory furnaces.

A steam engine is employed to operate the heavier machinery, while the lighter are driven by electric motors. Power is obtained from the central heating and lighting plant of the University.

As there is no customs ore testing plant in the Province capable of handling large quantities, it was decided to keep the laboratory open throughout the summer. It was believed that this would fill a long-felt want in Eastern Canada. The work is under the direction of Prof. S. F. Kirkpatrick, and a graduate of the School has been engaged as assistant.

The following classes of work are undertaken: Stamp mill amalgamation, followed by concentration; preliminary cyanide tests of small quantities of ore, concentrates, and tailings; complete cyanide reports on the availability of that process for treating the product; concentration tests by one or more methods on lead and copper ores; crushing and sampling large quantities of ore to insure accurate sample for assay; complete analyses and reports on the smelting qualities of ores, etc.

Persons contemplating erecting a plant to handle any kind of ore might find it profitable to have preliminary tests made at such a laboratory in order to know what kind of treatment was best suited to their ore. Owners of gold properties would receive more definite and satisfactory information from the treatment and actual bullion returns of a ton or more of their ore than they could obtain from any number of assays.

OBITUARY

The death occurred at Halifax on the 28th ultimo, of Mr. T. R. Gue, president of the Acadia Power Company, and of the Dominion Electrical Works. Mr. Gue was a native of the State of New York, but came to Canada some thirty years ago and was appointed secretary of the Hamilton Powder Company in Montreal. He has resided in Halifax for the past eight years. Mr. Gue had a wide circle of friends and acquaintances in the Province of Quebec and in the Maritime Provinces, and he was universally liked and respected. He was one of the oldest members of the Canadian Mining Institute.

PLATINUM IN NEW ZEALAND

In view of the falling off in the supply of platinum from Russia, the chief source of production, and the steadily increasing demand for the metal, the report, recorded in Bulletin No. 1 of the New Zealand Geological Survey, that platinum has been discovered in the Hokitika district of that colony, is of possible economic interest. Further, the manner in which the mineral occurs, in quartz veins close to the Pounamu belt of magnesian eruptive rocks, is of considerable scientific interest, as apart from the fact that platinum is not frequently found *in situ*, when found in its native zones in New Zealand it usually occurs actually in the magnesian eruptive rocks.

The only recorded occurrence of platinum in New Zealand was observed by Mr. T. A. Pond (*Trans. New Zealand Inst.*, 1882), who stated that gold, silver, platinum and iridium was found in quartz obtained from a depth of from 540 to 600 feet in the Queen of Beauty shaft at Thames, Eew Yealand.

Platinum has been found in the present instance in the two veins where in the most important of which the white semi-vitreous platiniferous quartz occurs in lenticular seams intercalated with the country rock, which consist of a dark shaley phyllite. Assays of two samples of this quartz yielded the follows results:

1—Platinum, 3 dwts., 8 grs.; ag., 1 oz., 4 dwts., 9 grs.
2—Platinum, 1 dwt., 2 grs.; ag., 7 dwts., 13 grs.

In the second locality the platinum occurs in a bedded quartz vein, which attains a maximum width of about a foot, and is enclosed in banded schists. The vein contains a small proportion of pyrite and chalcopyrite.

The physical condition of the metals in the above samples has not yet been determined, but it is to be noted that in each case the silver accompanies the platinum in the ratio of 7 to 1, suggesting a combination of the two metals.

Platinum has been found in place in Canada, but except in the case of the Sudbury sperrylite, and which in limited quantities is recovered and marketed as a by-product from the nickel-copper ores, the deposits containing the mineral have not been turned to commercial account. At another locality in Ontario, near Wabigoon, Rainy River, platinum was reported to have been found two or three years ago in some of the eruptive rocks there.

In British Columbia, from the Similkameen, sent for analysis to Messrs. Baker & Company, of Newark, N.J., returned very satisfactory platinum values, although it is understood the Provincial Assayer of British Columbia failed to obtain results. Prof. Kemp, however, found traces of platinum in the granite, more or less decomposed, on Siwash Creek, a tributary of the Tulameen. From the evidence, it seems clear that platinum is not confined to the basic eruptions. This is pointed out by Dr. C. W. Dickson, who has especially investigated the subject.

In this issue our representative in the West summarizes the car shortage situation. Allusion is made to the failure of the C. P. R. to live up to its promises. Our correspondents' facts are incontrovertible. We are glad to be able to publish the clear, straightforward statement of an actual observer. Upon the various phases of fuel transportation in the West we shall have more to say presently.

TINSTONE IN NORTHERN NIGERIA

In the last number of the Bulletin of the Imperial Institute a brief description appears of the alluvial tinstone deposits of Northern Nigeria. The deposits occur in the south-west part of the province of Bauchi, near the river Delime, which flows north-east towards Lake Tchad. The tin-bearing alluvium, as far as is known, is restricted to the plateaux of Tilde, Rukuba, Jos and Ngell. The rocks of the Tilde and Rukuba plateaux consist of soft felspathic gneisses which are often garnetiferous, and are cut by veins of muscovite-pegmatite. Dykes of basalt and dolerite are also of frequent occurrence. The rock composing the plateaux of Jos and Ngell is a reddish biotite-granite, passing into a quartz-porphery on the margin.

Although tinstone has hitherto been found only in the gravels, lumps of tinstone, more or less angular in shape and having a granitic matrix, have been discovered in the neighborhood of Jos. This has led to the supposition that the tinstone is probably disseminated in the red granites, with lodes in the neighborhood of the coarse material.

The tinstone is very irregularly distributed in the gravel, the yield in adjoining pits varying from 10 lbs. or less, up to 100 lbs. per ton. Metallic tin is frequently found in small quantities in the sands and gravels of the river Delime. It probably represents material smelted by the natives and subsequently thrown into the gravel with rejected slags.

The "black tin" obtained by washing the gravels is seldom pure tinstone. A separation made by an electromagnet gave the following results:

Ilmenite,. garnet, about 20 per cent.

Monazite, about 5 per cent.

Tinstone with some zircon, rutile, quartz, about 74 per cent.

The Niger Company in 1905 applied for mining licenses in certain selected areas with a staff of four Europeans, and some 200 native laborers, and large stores, offices and native houses constantly employed; they are now steadily progressing. The fuel used is entirely wood charcoal.

BOOK REVIEWS

The Copper Mines of the World, by Walter Harvey Weed, illustrated, New York and London, Hill Publishing Company, 1907, pp. 375, 9 inches by 6 inches. Price $4.00 postpaid.

In this volume the author has carefully and thoroughly, presented a bird's eye view of the salient features of the geology of the principal copper deposits of the world, and has then added descriptions of the principal copper mines of the world. A series of maps gives a clear idea of the actual location of each of the more important copper districts in the old and new worlds. The mineralogy and geology of copper are discussed in separate chapters in a manner succinct and satisfactory. Cross-sections and plans of leading mines in Europe, Africa, Australia and America, illustrate successive chapters. The book is most evidently the result of a very large amount of discriminating labor and careful editing. The volume is a much needed addition to the literature of copper.

The Mineral Industry—its statistics, technology, and trade during 1906—edited by Walter Renton Ingalls, volume XV. Hill Publishing Company, 505 Pearl street, New York, pp. 954, 9 inches by 6 inches.

The annual volume of "The Mineral Industry" is too well known to require any introduction to the mining public. Summarizing as it does the whole growth and condition of mineral production in the United States, its value as a work of reference cannot be overestimated. The contributors to the volume are men of the highest rank. Each important mineral and metal is dealt with by a specialist. The world's mineral production is tabulated. Most interesting of all the sections is that on the progress in ore dressing and coal washing in 1906. Robert H. Richards and Charles E. Locke are responsible for this contribution. As a resume of the latest developments in these two important subjects it is invaluable. It contains among other subjects a digest of ball and tube mill practice. No mining man should neglect securing one of these volumes. It is most obviously a necessity.

The Canadian Annual Review of Public Affairs, 1906, by J. Castell Hopkins, The Annual Review Publishing Company, Toronto, Ont., pp. 659, 8½ inches by 6 inches.

In thirty-two pages of this bulky volume the progress and conditions of mining in Canada during 1906 are traced. In all the Review is a well designed record of Canadian public growth. It is clearly printed and fully illustrated.

Public Roads, Their Improvement and Maintainence, by E. R. Buckley, Ph.D., Director and State Geologist, Missouri Bureau of Geology and Mines.

The subject of good public and private roads is one of prime importance to the Canadian mine-operator. In many districts corduroy roads are the only highways available for the transportation of heavy freight to isolated mines. Every bad road implies loss of energy and waste of material, time and money. There is crying need of road improvement in New Ontario. In Nova Scotia lack of cheap transportation has closed down or prevented the development of a number of otherwise workable mines. This official publication is a practical and exhaustive treatment of the subject and will make good reading for our road-makers.

Dredging for Gold in California, by D'Arcy Weatherbe. First edition. The Mining and Scientific Press,, San Francisco, 1907, pp. 217, 8⅞ inches by 6 inches, 106 illustrations. Price $4.00.

Introductorily the author acknowledges the suggestions and help of many writers, operators and others, who have put material at his disposal. Owing to Mr. Weatherbe's absence in South America, Mr. T. A. Rickard edited the book. The result is a clear, attractive and creditable volume.

In arrangement a logical sequence is followed. The order of subjects is: 1st, Prospecting dredging ground. 2nd, Dredging machines. 3rd, Operation. 4th, The metallurgy of dredging. 5th, Costs. 6th, The horticultural question. 7th, General. The volume closes with a series of contributions and discussions by J. H. Curle, G. L. Holmes, T. A. Rickard and C. W. Purington.

The subject of gold dredging is one which is daily growing in importance. In the Yukon and British Columbia and in the new provinces large fields await the pioneer. Mr. Weatherbe's book is thus timely. Moreover the average mining man is singularly ignorant of both the possibilities and limitations of this branch of gold winning. The volume should prove a source of help to operators and a very valuable addition to every mining engineer's library.

Senator Jaffray and other members of the Board of the Crow's Nest Pass Coal Company, left Toronto towards the close of July on a visit of inspection of the company's collieries at Fernie, B.C.

EXCHANGES

The Mining Journal, August 3, continues its series of papers on "The Systematic Treatment of Metalliferous Waste."

The Iron and Coal Trades Review, August 9, opens with a paper on "The methods adopted in the Hungarian Government steel works for avoiding piping in steel ingots." Interesting data are given as to the use of Thermit.

In the Mining World, August 17, Woolsey McA. Johnson describes the Kelly mine, New Mexico, and treatment of its ores. The zinc carbonates of this camp carry only one-tenth of one per cent, sulphur, and no silicate of zinc. The silica in the carbonate is combined

The Engineering and Mining Journal, August 17, opens with, "The Nomenclature of Modern Placer Mining," by J. P. Hutchins. The Briton Ferry Works of the Cape Copper Company, South Wales, is described in another article by Edward Walker. It is here that

An illustrated article on "Pioche, Nevada," appears in the Mining and Scientific Press, August 10. Pioche, a mining camp of Eastern Nevada, flourished and prospered in the early seventeies. It fell upon evil days after 1875. Now it is to be connected with the rest of world by railroad. Large bodies of low grade ore, commercially valueless under the conditions of thirty years ago, will be opened up.

the Tilt Cove ores are smelted.

The Journal of the Chemical, Metallurgical and Mining Society of South Africa, June, has a practical and suggestive paper on "The Utilization of Waste Heat in Slimes Settlement," by A. Salkinson. By the use of exhaust steam and pump, Mr. Salkinson effected a increase of capacity of 20 per cent. in his cyanide plant and brought his extraction up from 91.192 per cent. to 92.887 per cent.

Economic Geology for June begins with "Concentration of Gold in the Klondike," by J. B. Tyrrell. Referring to the quantity of rock washed down by eroding and transporting agencies, Mr. Tyrrell computes the time necessary for the removal of 900 feet of surface, as approximately 3,600,000 years. "A thickness of 900 feet over an area of 800 square miles would equal a mass of 136 cubic miles or 1,600,000,000,000 tons of rock This is therefore the quantity of rock that was removed by denudation, and from which 10,000,000 ounces of gold was washed and concentrated into the Klondike placers, and it represents an average gold content of 0.003 grains or 0.013 cents to the ton of the original rock in place. It is thus seen that the Klondike district owes its phenomenally rich placers not to the wearing down of highly mineralized gold-bearing veins or lodes, but rather to the favorable conditions of long continued and uninterrupted concentration from a great mass of rock that contained only very minute quantities of gold."

The second artilce in Economic Geology for June is entitled, "On the Microstructure of Nickeliferous Pyrrhotites." The authors are Prof. W. Campbell, of Columbia, and Mr. C. W. Knight, asssistant geologist of Ontario. In this metallographic examination of nickel ores from widely separated localities, many points of similarity were found. Pyrrhotite, pentlandite and chalcopyrite were found to compose the ore, having a sequence of origin in the above order. The two last named sulphides are closely associated and have a habit in common. All of the ore bodies are associated with basic eruptives. The writers do not favor the theory of magmatic segregation.

Three excellent papers are contained in Mines and Minerals for August. "Notes on Hydraulic Mining," with special reference to the Cariboo District, B.C., and Yukon Territory. In the course of the paper the impression that the Cariboo working season is limited to a few months is corrected. Actual washing operations are carried on for about 200 days each year. Prof. F. W. Traphagen writes on "The Treatment of Zinc Ores." He notes that the use of oil concentartion has not been applied on a commercial scale in the State of Colorado. Briefly the ore is roasted with some coal admixed, zinc is reduced, volatilized, again oxidized and together with the lead sulphate formed at the same time, carried to the bag-house. The cinder from the "roasters," ore from various sources, limestones for flux and the necessary fuel, are smelted in a low-column blast furnace operating with a hot top.

"Colliery Warnings" is the title of a leading article in the Colliery Guardian, August 9. The writer carefully sums up various opinions regarding the relation of barometric movements to colliery disasters. He advises the adoption of a system of warnings of the approach of cyclonic disturbances, which are known to travel in a definite path and with a definite velocity. "Forewarned of the probable track of one of these atmospheric eddies, collieries lying in or near its path would be in a position to adopt precautionary measures." It is mentioned that both England and America make very little use of the aid of the modern science of weather forecasts, despite the general admission by mining engineers that atmospheric influences are certainly capable of setting up in a mine a state of things, which, even if it does not produce an explosion, is favorable to the establishment of critical conditions.

PERSONAL AND GENERAL

Mr. Gallagher, of the Hamilton Power Company, at present convalescing in Tadousac, Que., will soon return to his post. He is already much improved in health.

Mr. Hugo Kellegren, of Clarkson, Wash., one of the directors of the Washington, Idaho & Oregon Reduction Co., controlling the patents in Montana, Washington and Idaho, for a new method of ore reduction, is visiting Rossland and inspecting the smelting works of the district.

At a periodical clean-up of one of the dredges operating in the Yukon the following strange collection of articles was found in the sluice box: Two Russian bronze icons; eight American pennies; 100 pounds of unexploded cartridges: 120 pounds of nails: an alarm clock; a saw set; two Masonic charms; an opal scarf pin; knives, forks, keys, locks, native bismuth, cassiterites, stanites, magnetic octohedrons, bushels of black sand and several nuggets worth over $10 each. The last item caused some surprise, as it had been generally supposed that the gold in this particular basin was of fine quality.

The manufacture of Portland cement is becoming a very important industry in the Province of Alberta, where the demand considerably exceeds the supply. In consequence the capacity of existing plants is being largely increased, while other factories are in course of erection. One of the largest of these is a new factory at Exshaw, which, it is said, will be the most completely equipped plant in America; while the supply of raw material in the vicinity is practically inexhaustible.

Mr. J. A. Whittier, manager of the Goodenough mines, Sandon, B.C., has returned home after wintering in California.

Mr. J. E. McAllister, general manager of the B. C. Copper Co. has returned to Greenwood form a visit to Eastern Canada.

Mr. A. P. Low, Deputy Minister of Mines, left Ottawa on the 8th inst. for the West, where he will visit the several mining districts of Alberta and British Columbia.

Mr. E. Brydon-Jack, until recently professor of civil engineering at Dalhouise University, Halifax, N.S., has accepted the chair of Civil Engineering at the University of Manitoba, Winnipeg.

Some important new discoveries of coal are reported to have been made in the Eagle Lake district of Alberta, and the Provincial Inspector, Mr. Frank B. Smith, is now engaged in making an examination of the area.

Mr. R. W. Brock, after reporting on the Larder Lake District for the Ontario Government, has returned to British Columbia to continue work for the Geological Survey of Canada in the Lardeau and Rossland districts.

In a recent interview, Mr. M. M. Johnson, chief engineer of the Dominion Copper Co., is reported to have stated that the best average costs at the Boundary Falls plant for a month's run was $1.51. This is higher than other averages in the district, but Mr. Johnson stated that Dominion costs are by no means yet down to a minimum.

Mr. G. L. Holmes, of San Francisco, contributes an interesting letter which appears in the *Engineering and Mining Journal* of August 10th, on the subject of "Platinum in the Yukon." The writer suggests that the reported discovery of platinum bearing sands on the Hootalinqua river, should be received with the utmost caution, since the investigations carried out by himself and another mining engineer in 1900 in the locality mentioned, proved practically resultless. The company Mr. Roberts represented held a lease on a tract 80 to 85 miles above the mouth of the river, and prospecting was carried on at every bar for about ten miles below the last camp. The samples obtained all contained traces of gold, but none of them showed platinum. The greatest amount of back sand found in any one place was about half an ounce in twenty pounds of original gravel, which would signify that at least 300 lbs. of gravel would be required to yield 15 oz. of black sand. This last statement is made to controvert the report that 15 oz. of black sand from 200 lbs. of gravel had yielded 0.7 grams of platinum.

It is satisfactory to note that immediate steps are to be taken for the establishment of a mining engineering college, to be in large measure associated with McGill University. Thus at a recent meting at Vancouver of members of the Roval Institution for the Advancement of Learning, it was announced that a lease for a site had been obtained from the Government and that a building would be erected thereon to cost in the neighborhood of $100,000. Already endowments have been provided for four chairs, namely a Chair of Mining and Chemistry by the Hon. James Dunsmuir, Lieutenant-Governor of British Columbia; a Chair of Civil Engineering endowed by Mr. A. C. Flumerfelt, a director of the Granby and of the International Coal Companies; a Chair of Pure and Apllied Mathematics, endowed by Mr. F. Carter-Cotton, editor of the Vancouver *News-Advertiser*, and a Chair of Modern Languages, endowed by McGill University graduates resident in British Columbia. A summer school for instruction in the field is also to be established in one of the mining districts of the province.

Mr. S. S. Raymond, general manager of the Brittannia Smelting Co., Crofton, B.C., is visiting the Coast on a tour of inspection.

Mr. R. H. Stewart, manager of the War Eagle and Centre Star mines at Rossland, B.C., is spending a month's holiday in Ottawa.

Mr. A. B. W. Hodges, local manager of the Granby Consolidated M. & S. Co., has been spending a brief holiday at Hayden Lake.

Mr. T. R. Weeks, for three years Messrs. Guggenheims' mining engineer, recently inspected the Hanson Consolidated silver mines at Cobalt.

Mr. Montague Davys, a resident in the Kootenays of nineteen years' standing, where also he has large mining interests, is leaving Nelson shortly to reside in England.

Mr. H. Mortimer-Lamb, secretary of the Canadian Mining Institute, left Montreal on the 20th inst., for the west, where he expects to spend six weeks visiting the mining sections of Alberta and British Columbia.

For the fiscal year ending June 30th, Kootenay lead production, on which, subject to conditions, a bounty is paid by the Dominion Government, was 23,754 tons, the lowest in four years. Of this total, 18,494 tons were consigned to Europe and American and the balance to the Orient. The most important producing mine was the St. Eugene, which contributed 14,719 to the year's yield.

According to a report furnished the American Iron and Steel Association by manufacturers, Canada's production of pig iron during the first six months of 1907 was 270,100 tons, a slight decrease as compared with the return for the corresponding period of 1906. With the operation of other plants now completed it is reasonable to expect that ere the close of the year the deficiency shall have been more than made good. On June the 30th, there were ten furnaces in the Dominion in blast, while four were idle for the time being.

In a recent report the United States vice-consul at Dawson refers to the change now taking place in mining methods in the Yukon, and more especially in the vicinity of Dawson, where dredging is entirely replacing the work of individual miners. This has, of course, had the effect of not only depopulating the creeks but has also hit tradesmen and merchants in the town somewhat severely, since the demand for supplies and provisions by miners has been considerably curtailed. On the other hand the change in conditions has and is proving beneficial to the small mine holder who has now the opportunity of selling at a fair price a property which would scarcely pay to work by the old methods of wood fire or steam thawing. It has, moreover, created activity in the staking of unoccupied ground which heretofore was not considered workable.

The output of copper from the Boundary District for the half year ending June 30th, is though relatively satisfactory, disappointing as compared with the 1906 figures. Thus during this period the two refineries in the United States to which the product is consigned, received in round figures fourteen million pounds, as compared with nearly eighteen million pounds for the first six months of 1906. The decrease of course is merely temporary, due largely to a shortage of railway cars and of coke for the smelters. Once these drawbacks are removed the output of the Boundary mines should continue to show a large increase, as it is proposed to enlarge the smelter at Grand Forks, while the Dominion Copper Co. is arranging to install converters and other wise increase the capacity of its smelting plant at Boundary Falls.

Mr. J. T. Hillis, managing director of the Hidden Creek Mining Co., operating properties near Port Simpson, B.C., is now residing in Vancouver, where offices have been established.

Mr. Stanley N. Graham, Superintendent of Mina El Favor, Jalisco, Mexico, is visiting Canada for a few weeks. Mr. Graham reports the El Favor as showing up high silver values.

Mr. D. A. McAulay, late assistant chief engineer of the Western Canadian Collieries Company, Blairmore, B.C., has been appointed chief engineer of the North Atlantic Collieries, Port Morien, Cape Breton.

The Hon. Robert Drummond returned from his trip over the water, and arrived in Sydney on the 12th August, where he will appear as a witness for the Coal Company in Steel v. Coal.

Mr. J. W. Frank, a mining engineer of Reno, Nevada, has recently returned from a visit to the oil fields on the Athabasca river in the interests of the British-American Oil Company, of Seattle. Mr. Frank speaks very enthusiastically of the potentialities of this field, and also refers to the occurrence of ashphaltum in great quantity, which he believes may under more favorable conditions than at present existing be turned to commercial account.

Gold dredging on the Saskatchewan river has heretofore not been attended with any notable success; but apparently another attempt is to be made on a larger scale, and a dredge having a daily capacity of from 2,500 to 3,999 cu. yds. a day is being installed at Mud Creek by the Northey Dredging Company to operate over a distance of fifteen miles of river bed covered by the company's leases. It is stated that it is also hoped to recover platinum, of which there are fair prospects.

According to a tabulated statement published by the *Mining Reporter* (Denver), the mines of the United States and Canada paid the sum of $17,767,788 during July. The largest individual dividend was that of the U. S. Steel Corporation which is credited with a distribution of over two and half millions, while the Anaconda Copper Co. follows next with a dividend payment of two million, one hundred thousand dollars. So far as Canada is concerned we note that our contemporary's returns are by no means complete.

An interesting drilling contest took place recently at Rossland between the members of the assaying and surveying staffs of the Centre Star mine. It is reported that great damages was done to the rock by both teams. However, the assayers managed to hit the head of the drill oftenest and won the match with a record of eight and five-eighth inches.

Mr. Shirley Davidson, who together with Miss Eilleen Hingston, was drowned in the St. Lawrence at Varennes on the 3rd of August, was very well known around the collieries at Glace Bay. Mr. Davidson came to Cape Breton as electrical engineer for the Dominion Iron & Steel Co., and later he went with the Dominion Coal Co., as assistant engineer. He left the coal company in 1905 and at the time of his death was practising as a contracting engineer in partnership with Mr. P. von Aueberg, late the coal company's construction engineer. As far as the circumstances attending the accident can be surmised there can be little doubt that Mr. Davidson lost his life in the attempt to save Miss Hingston. Those who knew Shirley Davidson say this was just the sort of thing that he would do, and he will not soon be forgotten by his friends at Glace Bay and Sydney.

Mr. T. J. Smith, President of the Diamond Vale Coal Mines Limited, who is at present visiting Montreal, stated in the course of an interview, that in his opinion it will scarcely be possible, even with increased development, for the coal mines in the west to keep pace with the great and growing demand for fuel required for railway and smelter purposes in Alberta and British Columbia. A determined effort, notwithstanding, is being made to meet this demand, and in nearly every case the mines in a position to ship have increased their working forces. The Diamond Vale mines are situated in the Nicola district, to which a branch line of the C. P. R. has just been constructed. This will afford a market for the Nicola coal not only in the Kootenays, but at the Coast. It is interesting to note, according to Mr. Smith's statement, that heretofore coal used for blacksmithing purposes in British Columbia has been brought all the way from Cape Breton at a cost of $18.50 a ton; but it is thought that this will no longer be necessary, since the Nicola coal is said to be quite suitable.

CORRESPONDENCE

To the Editor, CANADIAN MINING JOURNAL.

Allow me to welcome THE CANADIAN MINING JOURNAL as an unexpected but powerful ally, and to thank you for the summary, in 15th July number of the discovery of the Klondike.

I have worked on this matter for eight years, or since hearing in 1899 Henderson's story of the discovery. I was then editor of *The Yukon Sun*, and believed, as now, that a Canadian should get credit for his work.

Of the many articles written by me for Ontario papers, nearly all have been returned with the intimation that the subject was not of interest now—not as interesting as Mrs. Jones' garden party, and what the guests wore.

Most of these papers prefer to copy (because they are cheap) the sensational lies concocted in Seattle, as news from Dawson "Alaska." When a Yukoner attempts to correct them they suppress his letter. Because of Carmac's residence in that city, the Seattle papers have made a determined effort to establish his claim to the title of discoverer.

To settle the matter for all time, I have during some years past secured letters from all the Commissioners (Governors) of the Yukon, and from the leading pioneers (from the latter affidavits) all giving Robert Henderson, of Pictou, Nova Scotia, the full credit.

These gentlemen are: Wm. Ogilvie, Hon. Jas. H. Ross, Fred. T. Congdon, W. W. B. McInnes; also from acting Commissioners Major Z. T. Wood and J. T. Lithgow, and from Dr. Alfred Thompson, M.P. for the Yukon.

The affidavits are from leading pioneers like Thos. W. Kirkpatrick, Thos. W. O'Brien, Alexander McDonald (King of the Klondike), Al. Day, Jas. McNamee, Wm. Lloyd, M. F. Thompson, Abram H. Anderson, Carlo Tilley, and others.

Mr. Wm. Ogilvie, a pioneer of 1887, 1905, etc., and by far the best authority on early Yukon history, writes me:—

"1st. Robert Henderson discovered gold on the Indian River fully a year before Carmac was on the Klondike in any way as a miner.

"2nd. Henderson discovered gold in the Klondike basin months before Carmac.

"3rd. It was through information and advice given him by Henderson that Carmac thought of visiting the Klondike as a miner.

"4th. To the above facts I have as my authority the narrative of both men, given me personally."

Carmac was invited by Henderson to leave his salmon fishing and Indian wife at Dawson, come up and stake on his new find on Hunker Gold-Bottom Creek. When Carmac was leaving, after staking, Henderson straightly charged him to test the gravel on Rabbit Creek (now Bonanza), and if he found anything, to send one of his Indian companions back, and Henderson would pay him (the Indian).

Carmac stumbled on the richest part of the Indian River—Klondike gold fields—already pretty well mapped out by Henderson's work and discoveries in both basins of the district, but his base ingratitude prevented Henderson from securing a rich claim as a reward for his years of solitary, dangerous and thankless work.

Henderson's reward for his pluck, tenacity and endurance, and for being instrumental in adding $150,000,000 in gold to the world's supply, as well as giving Canada a world-wide advertisement, was as follows:—

1. He received a ghastly and almost fatal wound in his leg while prospecting all alone on the upper waters of the Indian River in 1895.

2. He was for a time deprived of the credit for the discovery of the Klondike because he did not become wealthy, while Carmac, without forethought or labor, did.

3. He was deprived of the credit of naming Hunker Creek, which he discovered and staked before Hunker saw it. Henderson's name of "Gold Bottom" still persists on its branch.

4. He was refused by the proper Government official the record of two discovery claims justly due him. He was allowed to stake one claim out of five properly applied for. The Department of the Interior, six years later, admitted the wrong.

5. He was refused, while still weak from a surgical operation on his injured leg, the ordinary courtesy of a proper extension of time, in which to represent his claim on Hunker, and had to sacrifice this rich claim for a song, or lose it altogether.

6. He was put off with excuses ("mislaid book") in applying for a renewal for his Quartz Creek claim, until it lapsed and was lost to him.

7. He was, many years later, granted in compensation, the worthless right of staking four claims (2,000 feet) on any unoccupied Government ground, but when he found anything of that kind worth staking, he was always met with the statement that it was already applied for (in some cases for compensation).

8. By the financial aid of the writer he was sent to Ottawa to press his just claim, but had no show there. The Hon. Jas. H. Ross kindly secured him a temporary appointment on the mining staff in Yukon. The Department of the Interior saw to it that he receives, next to the charwomen, about the lowest Government salary in Dawson.

9. His valuable services have been freely availed of by the Government, and for two years past he has accompanied geologists on their trips up Pelly River, where Henderson believes there are rich placer gold diggings to be found.

When I took up the matter for Henderson through Lord Minto in 1900-01, the Department of the Interior attempted to turn me down. How they succeeded will best be known by reading this extract of a letter from the said Department to the Hon. Jas. H. Ross, Commissioner of the Yukon, in May, 1902, after a full investigation of the matter:—

"The regulations in force for the year 1896 provided that no miner should receive a grant of more than one mining claim in the same locality, and that it was not until January, 1898, that provision was made in the regulations that the miner should receive a grant of only one claim in the same district, the boundaries of which were to be defined by the mining recorder.

"As the creeks upon which Mr. Henderson claims to have staked could scarce be considered as being in the same locality within the meaning of the regulations, and as the regulations at that time did not provide for the formation of mining districts, it has been decided that Mr. Henderson should be granted consideration in accord with the regulations in force at the time he staked and recorded.

"Please advise this Department of the consideration you think should be granted to Mr. Henderson for the loss alleged to have been sustained by him."

But that is about as far as the compensation has gone. And that is the usual manner in which brave, generous, indomitable and far-seeing pioneers like Robert Henderson, of Pictou, Nova Scotia, are treated by their fellows and by paternal Governments alike.

I shall be pleased to write you a brief account of his work in discovering the Klondike if you wish it.

Yours,

HENRY J. WOODSIDE.

Ottawa, Ont., Aug. 6th, 1907.

The Editor, The Canadian Mining Journal:

Sir,—I have read your "Suggestion" in the number of August 1st, regarding the advisability of uniting the offices of Secretary and Treasurer.

It seems to me that the objection to this is that people would say there was no check on the officer holding the dual office. So far as I am personally concerned, my opinion is that anything which increases the salary of the Secretary is advisable, because upon him and him solely, depends the extension of and stimulation in the Institute between sessions. An institute of this kind, which is active at only a limited period of the year, soon becomes forgotten unless a man of strong character, magnetism, ability and energy, like Dr. Raymond, of New York, stamps it with his own character. Undoubtedly the American Institute of Mining Engineers depends for its activity and prominence more upon Dr. Raymond than on all other influences combined.

A man understanding mining and the interests of mining, and of the character above mentioned, should be the Secretary; and, if necessary to make it an object, the Treasurer as well, although it seems to me that the Institute should pay a liberal salary to its Secretary, independent of the duties of Treasurer.

Without doubt, the mining interests of Canada are increasing so rapidly, and becoming so extensive, that a flourishing and powerful Mining Institute should exist. I do not know Mr. Lamb very well, but I fancy he is a man of ability, and is well fitted for the office he holds, and I for one, although a member who has not been active during

the past eight years, shall always be in favor of making the consideration sufficient to recompense him for all possible expenditure of time and money, and make it an object for him to be exceedingly active. Yours very truly,

FRANK C. LORING.

To the Editor, The Canadian Mining Journal :

Dear Sir,—It is no doubt a matter of personal opinion as to how far your editorial of August 1st, entitled "Another Suggestion," was written in the spirit of fault-finding. When I first read it I certainly did not recognize any touch of personal criticism. The Canadian Mining Institute is young and its opportunities are growing very rapidly; no matter how efficient its individual officials may be its general plan of operations may well be open to criticism, and I for one would welcome your editorial as being timely and valuable even if it might be open to somewhat harsh interpretation.

There can be no question whatever about the Institute requiring the whole services and time of one man as Secretary, and in saying this I am making no criticism of the present Secretary, for whom I have a very warm personal regard. If the Institute cannot afford to command one man's whole time except by combining the two salaries of the Secretary and the Treasurer, I certainly think it goes without saying that the two offices should be held by one man. The only argument I can foresee against this is the personal argument as a result of the appreciation of Mr. Stevenson Brown's many years of valued work; but I am not discussing personalities, I would deal with this in the abstract. I would consider the Secretary by far the most important official of the Institute, more important than the President himself, for it is considered essential that the various widely separated mining centres of the Province be in turn represented in the official chair. The Secretary should belong to no centre, and consequently should act for all, and being more or less permanent in his position he can initiate and carry out plans and improvements requiring several years for their fulfilments. The present Secretary has been so intimately associated with the mining industry in Canada for so many years and in so many different parts that he is specially able to take a large general view. Everything that can be done to quicken his enthusiasm and strengthen his hand should most certainly be done.

You have touched upon a point of vital importance when you speak of doubling the membership within twelve months. It would be quite possible to double the membership and kill the usefulness of the Institute. This question of membership is one upon which I feel very strongly and it is one which requires perfectly plain, candid, outspoken discussion. There are two distinct types of institutions connected with engineering enterprise. The one is the select technical, the other the open, almost commercial, institution. The first is represented by the Institution of Civil Engineers and the Institution of Mining and Metallurgy. Members of these Institutions are all technical men of experience and good standing. They have a sealed certificate of membership which is practically a diploma and which to a large extent is a guarantee of good standing. Of the other class the Institution of Mining Engineers and the American Institute of Mining Engineers are typical examples; almost anybody can obtain membership in these. It is an open question which of these types is the more valuable, but there is no question whatsoever of the very great value of the American Institute. The Canadian Mining Institute is neither one thing nor the other; it imitates the English idea of the ultra-select technical association by giving a large, red-sealed certificate of membership, on the other hand it has admitted almost anybody and everybody into membership. It is time that the Institute came out definitely and plainly in regard to this point. A move was made in this direction at the last general meeting by the amendment of the by-laws, arranging for Associate Members. This seems to me to be a rather hesitating attempt towards making this a select society based on the English pattern. I do not think this suits the present conditions. I am most certainly in favor of an open society, similar to a large extent to the American Institute, but though I am in favor of a more open membership I would draw a very hard, well-defined line as to who should not be members. Those interested in mining can be divided into two classes. Those seeking to make money out of the ground and those seeking to make money out of the public, and there is a very great gulf between these two classes. I would admit to full membership everybody seeking to make money out of the ground, who has a clean reputation, whether he is an ultra-technical metallurgist, a shareholder or a mucker, but I would keep out as rigidly as possible everybody seeking to make money out of the public. This would keep out almost all the brokers and almost all the promoters. There is a very small minority of promoters and brokers who would be valued members, but I would rather lose these than run chances of admitting the average broker or promoter. A medical association might better have the vendors of a fake patent medicine among its members than for us to have the wild-cat promoter and broker in our Mining Institute. It is always an unexplained wonder how the public tolerates these wild-cat promoters. Many hard-headed business and professional men who have all their life been building up and caring for their reputations, have allowed them to be prostituted in these wild-cat prospectuses. The average mine promoter is a procurer; he panders to the gambling spirit and he does not care whom he ruins so long as he can sell his stock. This type, and by far the largest number of mining company promoters belong to this type, should not, under any circumstances, be tolerated in a self-respecting association of business men. It is not necessary to have any special by-laws to keep these men out. The present by-laws are sufficient, and the action of recent councils has been in the right direction, but it behooves the present council to be still more careful in their choice of members.

I do not like the new by-laws admitting Associate Members. Let me illustrate by a special example : Under this new clause the business manager of a machinery supply house or of a powder manufacturing company would be an Associate Member with no power to vote, yet this class of men knows more of the mining industry throughout the country and has got the general welfare more at heart than any

technical mine manager or metallurgist. These business men probably will not write papers nor will they take much part in technical discussions, but their experience and training would be of very great value in all matters of general welfare. This is the type of men that I would welcome into the Institute.

The technical man cannot look to the Institute to promote or preserve the tone or standing of either the individual or the whole technical body. To expect this even in a small degree from the Institute is to narrowly circumscribe its work. Thanks very largely to the excellent choice of technical men in the Government departments the public has been, to a certain extent, educated to a respectful appreciation of the tone and standing of the technical man. Our Government mining men are only carrying out the traditions of their training, but their work is laying a good foundation. This work must be carried on by the individual technical man and not by the Mining Institute. The words of Dr. Raymond in connection with the American Institute fit our case exactly: "The pressing need of the hour was not the segregation of a select body, but the cordial co-operation of all the representatives of a great industry or group of industries."

Yours faithfully,

H. E. T. HAULTAIN.

Craigmont, Aug. 22nd, 1907.

To the Editor of The Canadian Mining Journal:

Sir,—I note in your last issue a letter from Mr. W. H. Prest, criticizing my remarks regarding the stealing of gold in Nova Scotia.

Mr. Prest is right in saying that I am far from wishing to blacken the character of Nova Scotian miners as a class, but the facts that I have stated have come from miners themselves, foremen and others, men in whom I have the greatest confidence.

My object in stating the facts so openly is that the subject has been kept comparatively quiet, and the matter of gold stealing has not become to any extent a matter of criminal record. If the census reports, to which Mr. Prest refers me, contained the desired information there would be no need for more to be said on the subject.

As to the phrase, "Miners' rights," I know from personal experience that such a custom prevailed recently in at least one district in Nova Scotia and I am informed on the authority of credible, experienced men, men who may not have spent 35 years of their lives in Nova Scotia, but who at least are still here, that the so-called "Miners' rights" were known in other parts of the Province, notably in two districts situated about equi-distant east and west of Halifax. I am surprised that Mr. Prest has not heard of these "Rights."

Mr. Prest must realize that his picture of the conditions on the stopes is hardly a fair one.

On a large vein, where the whole belt was handled together, such conditions might prevail; but as a rule it was not such cases that furnished the greatest opportunity for stealing gold. It was in the small nuggety veins, where most of the gold occurred in specimens, such as that pictures on the cover of the last issue of the Journal, that most of the gold was stolen. In such cases the lode was, where possible, not mined until after the "working belt" had been removed, probably being scaffolded, when the quartz was shot down and shovelled to the shaft, often, as I have said, in a stream of water.

Why the idea of such a stream of water should conjure up visions of such immense pumping plants, I cannot imagine. The stream of water that a 4-inch "Jackhead" pump would handle would be quite sufficient to wash a lot of quartz lying as it would along the flat "underhand" stopes.

Yours very truly,

E. PERCY BROWN.

THE OIL SHALES OF SCOTLAND

An American Consular report dwells upon the oil shales of Linlithgow and Edinburgh Counties. The production of oil shale from these counties in 1904 was 2,331,885 tons. From this shale were extracted:—Burning oil, 16,991,746 gallons; naptha, 2,517,296 gallons; gas oil, 37,997 tons; lubricating oil, 39,476 tons; paraffin wax, 22,476 tons; sulphate of ammonia, 49,600 tons.

The workable seams occur in the upper of two subdivisions of the calciferous sandstone series. The upper, known as the oil shale group, is over 3,000 feet in thickness and contains in its higher parts beds of coal, usually of inferior quality, and, further down, about six main seams of oil shale, interstratified with beds of sandstone, shale, fireclay, marl, and estuarine limestone. The lower group, in which no oil shales of economic importance have yet been found, consists of white sandstone and shales passing downward into gray, green and red shales, clays, marls and sandstones, with beds of argillaceous limestone or cement or cement stone.

Good shale can, as a rule, be distinguished by its brown streak, toughness, and resistance to disintegration by the weather. Ordinary carbonaceous shale is more or les brittle and ofter gritty and weathers to clay or wind. Oil shale, on the other hand, resembles dark wood, and its quality is measured by the degree of facility with which it can be cut and curled up with the edge of a sharp knife. It is free from grittiness, and is often flexible as well as tough. In internal structure oil shale is minutely laminated, which is apparent in the "spent shale," after distillation, when it is thrown out in fragments composed of extremely thin sheets. It seems to be a general law that shales deteriorate with depth. The highest shale in the Scottish series is the richest in crude oil, supplying 130 gallons per ton, but only a few pounds of sulphate of ammonia, while the lowest shale yields only about 80 gallons per ton, but the sulphate of ammonia amounts to 60 pounds.

Mr. D. H. Pringle, formerly of the staff of the British American Trust Company, has been appointed general manager for the Galbraith Coal Company, the Alberta Coal & Coke Company, and the Alberta Fuel Company, with headquarters at Calgary, Alta.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

Glace Bay.—The plebiscite on the Scott Act was held on the 15th of August in Cape Breton County, and resulted in a majority of 1,000 against the retention of the Scott Act. The Nova Scotia License Act will automatically come into operation after the expiration of thirty days. It is a most stringent enactment, and unless altered will really act more as a prohibitive law than did the form of local option which is now repealed. The Provincial license law allows "off licenses" with certain restrictions, and licenses the sale of liquor to bona fide guests actually in the dining-room of hotels. It forbids the sale of liquor within certain limits of a tram line or colliery, and in the neighborhood of schools and churches. The vote just cast was very largely a religious one, the Presbyterians, Methodists and Baptists voting for the Act, and the Catholics and Church of England voting for license. Such a law must of course be inoperative, and it is to be hoped for the sake of our mining community that we shall get a workable and reasonably stringent law. Now that our legislators have the opportunity there will be no excuse if we do not get an act that will stop shebeening and secret drinking while providing protection for the inebriate and the minor. Glace Bay is not Utopia. It is a workaday place, and we want a workaday law that can be obeyed by the man in the street. We don't want to be left to the tender mercies of an unscrupulous brewing monopoly, and we don't want to live under the blue laws of an earnest but puritanical temperance party. Is there no golden mean?

We again commend this question to the consideration of the Provincial Workmen's Association, and we have reason to believe that if a concerted effort were made amongst the miners for the establishment of colliery reading rooms and recreative institutions along the lines of those established by the Colorado Fuel Co. before referred to in this Journal and for the passing of practical liquor laws it would receive the hearty support of the colliery corporations and the thinking men in the colliery districts generally.

In Sydney and the colliery districts there are little coteries of cultured people who have their reading circles and their literary and social societies, but for the great bulk of the laboring class absolutely no intellectual facilities of any kind are provided, outside of religious organizations, and the efforts of some earnest friends of technical education, who have received such feeble support that they have lost heart.

If the clergy and the P. W. A. would sink their religious, intellectual and political differences and take this matter seriously under advisement in the endeavor to provide for our mining and steel working population some refuge from the desolating boredom and intellectual stultification of so many of their lives, it would do more real good than libraries of prohibitory enactments and sermons. The P. W. A. and the various church organizations do a vast amount of good as it is, but anyone who views the aimless parading of Charlotte Street in Sydney and the expectorating crowd who nightly gather around the tram corners in Glace Bay, cannot but be impressed by the fact that our people lack occupation for their leisure hours. There is a connection between the success of American correspondence schools and the acuteness of the liquor problem in the mining districts that we think points to a desire on the part of the workers for intellectual and recreative occupation that at present is either ungratified or perverted from its natural fruition.

Arising out of the fatal accident by which three men lost their lives on the 6th of July, two employees of the Nova Scotia Steel & Coal Company have been arrested on a charge of manslaughter, and no doubt an investigation of the causes that led up to the accident will follow. This procedure is perfectly regular and follows on the finding of the jury, and would call for no comment, were it not that the "Halifax Herald" again reflects on the intelligence and honesty of our Mines Department and the mining community of Nova Scotia generally.

The "Herald" writes: "Will the Government publish statistics of the number of men killed in Nova Scotia mines last year?" This is a surprising question, seeing that the Department of Mines of Nova Scotia have published such statistics annually since the early seventies, and such a question confirms our previous suspicion that the "Herald" writer doesn't quite know what he is talking about.

The "Herald" makes a comparison between the mines of Nova Scotia and the mines and railways of the United States, and comments as follows: "By the time a President and a General Manager of Nova Scotia railways or mines are arrested for the deaths of men in their employ, through the failure of other employees to do their duty, then our big corporations will begin to take notice."

We welcome this comparison, for in it we have nothing to suffer in Nova Scotia, but heaven forbid that we should ever imitate the mines and railways of the United States in the matter of fatal accidents. We hardly think it is necessary to do more than quote the "Herald's" statement if we quote with it official figures showing how Nova Scotia compares with the other mining centres of the world as to fatal accidents. The figures will speak for themselves. Nova Scotia, as province, has nothing to be ashamed of in this respect, and we may safely claim that in Cape Breton the percentage of fatal accidents to the tonnage produced is the lowest in the world. The figures which are complied from the Report of the Mines Department of Nova Scotia for 1905, and from the Report of Foreign and Colonial Statistics, issued by the English Government and recently quoted in this Journal.

Statistics of Fatal Accidents in Mines, 1905:—

	Number of fatal Accidents.	No. of men employed in Mines.	Deaths per 1,000.	Tons Produced.	Tons per fatal Acc't.	Percentage of deaths per 10,000 tons Produced.
United States	2,160	626,000	3.45	356,454,000	165,000	.606 p.c.
Germany	1,123	548,000	2.05	173,811,000	154,773	.645 p.c.
Nova Scotia	20	10,870	1.86	5,050,420	250,000	.396 p.c.
Great Britain	1,138	843,000	1.35	239,918,000	210,800	.475 p.c.
France	182	175,000	1.04	35,928,000	200,000	.506 p.c.
Approx. tot'l for world	10,000	5,000,000	2.01	941,000,000	94,000	1.050 p.c.

It is a regrettable, but seemingly unavoidable fact that the mining of coal is everywhere alike attended by loss of life and limb, and the most careful supervision and care will not always prevent the occurrence of catastrophes, as witness the memorable explosion at Courrieres. This mine had been for years regarded as a model of safety, and the efforts of its engineers to minimise the loss of life by falls of roof had everywhere met with approval, but destruction came unawares at the last, and in a form the least expected.

The "Herald" says that if its interesting programme were

carried out the "big corporations would begin to take notice." They have taken notice. In 1905 the collieries of the Dominion Coal Company produced roughly 3,190,000 tons, with only six fatal accidents. This is an average of one per thousand, and a production of 530,000 tons per death. We believe this is unique.

At the present moment there seems to be an organized attempt among the newspapers of this Province to give a "black eye" to our mining industry generally. It is an ill bird that fouls its own nest they say, and we protest against this kind of thing, for Nova Scotians should be proud of their mining industry. It is the basis of their wealth, and supplies a vast population with employment, and we cannot see why for purely political ends our newspapers should pursue the course they do. Nova Scotia miners as a class are physically and mentally the superior of their brothers on the other side of the Atlantic and in the United States. They earn good wages, their labor organizations so far have been free from the evils that have characterized miners' unions in other parts of this Continent. As workers they produce more coal per man than in the majority of the mines of Europe. The coal seams here are magnificent big clean seams with roofs of exceptionally strong nature, the seams are so regular that a fault is almost unknown, their extent is as yet to a large degree unknown, the mines are kept ventilated by vast currents of fresh air, the surface equipment of the collieries is superb, and for production, safety, and general efficiency Nova Scotian mines will bear comparison with any bituminous mines anywhere. These are the facts, but a stranger reading the jeremiads of some of our provincial press might be excused if he came to the conclusion that our mines were death traps, our coal seams of poor quality, and our miners and their officers lacking in ordinary intelligence.

ONTARIO

Cobalt.—An arrangement has been made by the Nipissing people whereby they are to dispose of the cobalt from their ore in Germany. It is also probable that Nipissing will erect a smelter in Cobalt.

On one car load of ore La Rose mine recently netted $112,000.

Most of the mines, against which the Western Federation were most active, are working normally again. The Coniagas, Trethewey, Cobalt Lake, Buffalo, Nipissing and many others are doing full time. The obstructive tactics of the labor leaders are becoming more violent but less effective.

The Foster mine shipped a car of No. 1 ore early in August. It netted $28,500. Development of the mine is being pushed. About eight months of stoping is blocked out.

Organizer Roadhouse, of the Western Federation, is scarcely worthy of passing notice. He has been using such intemperate language that the better class of miners are losing all sympathy with him and his cause. His flowers of cheap and nasty rhetoric need a dash of scent. He is fast becoming a public nuisance.

The report that the Colonial Mine would meet all the demands of the Union (as did its neighbor the King Edward) has not been confirmed.

The O'Brien Mine has 135 men working. This number includes the necessary skilled labor. Recently four good veins have been stripped.

The Provincial Government Mine has installed the first half of a twelve-drill compressor.

Mr. E. L. Fralick, engineer of the Cobalt Lake Mining Company, in his last report of progress, states that shaft No. 4 is down 92 feet. A level station has been started in this shaft at 86 feet and the drift is in 46 feet. Shaft No. 5 is down 95 feet. Here also a level has been started.

The Temiscaming Mining Company's shaft has been sunk seventy-eight feet. Drifting to the extent of ninety feet has been accomplished. The first shipment was a car of 21 tons, for which the shippers received over $91,000. Two other cars were shipped last week.

ALBERTA.

Car shortage along Crow's Nest Pass.

Lille and Bellevue.—For lack of cars the company, having no place to store coal, knock off shifts and men leave, always the best men. Many of these men finding it no better in other coal mines, find work over ground or in quartz mines, and are permanently lost to coal mining.

Having no room to store screened coal, they cannot take out the slack coal, and consequently cannot keep the coke ovens running steadily. This again threatens the coke supply of the smelters.

Frank.—No complaint. The C. P. R. has contracted for total outpue and supplies sufficient cars.

Coleman.—The International Coal and Coke Co. have been hard hit. They were able to increase their hard hit. They were able to increase their output by doubling shifts. Before taking that step they asked the C. P. R. if they would furnish cars for increased output and were assured a steady supply. They went to extra expense, in doubling their shifts, which meant raising several men to "bosses" at increased wages. They advertised for more miners and got them. But when the output was increased the cars were not always supplied. The men were laid off for three days each in two successive weeks. Here again the men left and when cars came the company did not have the men. As a result the management never know what cars or what men to count on.

Michel, B.C.—Here, too, on the same assurances of cars from C. P. R., the Crow's Nest Pass Coal Co. put on a double shift with results similar to those at Coleman.

Coal Creek, B.C.—Here the Crow's Nest Pass Co. are helped out by the Great Northern Ry., and are not dependent on the C. P. R. The confidence thus promoted is reflected in the class of miners employed. They have the best class of miners along the Pass, including many married men who settle down here for their homes.

After talking with mine managers and C. P. R. agents, I conclude that the C.P.R. is partially responsible for shortage of fuel, coke and help. If they had no cars they could not be blamed. But that they have cars is evident from the fact that they assured the coal companies a definite supply right along. Moreover C. P. R. agents have told me that there are enough cars, but that the company gives preference to loaded cars over "empties," hauling the latter to the mines when they get time.

The Western newspapers are misleading on the car shortage question. In an interview in a Nelson paper, Vice-President McNichol, of the C.P.R., said their was no shortage. Similar interviews appear daily from other men. The facts are as stated above, and the outlook is that when the grain hauling starts, conditions will be worse. It is freely said that some smelters will close down next winter rather than hobble along as it seems now they will have to. If there is a fuel famine next winter it will not be due to lack of miners, but to lack of cars. The coal companies cannot store coal for future use nor get it out for dealers to store it.

The car shortage is not constant at any point, but is a constant menace, and the busy season for the railways is yet to come.

GENERAL MINING NEWS

NOVA SCOTIA.

Springhill, N.S.—The third week of the strike has brought no change. The Cumberland Coal and Railway Company has rechartered all its barges and tugs to outside parties, and has paid off its loaders at Parrsboro and St. John. The mine horses have been removed. In the improbable event of the mechanics joining the strikers, the Provincial Government has instructed Deputy Inspector Cameron to secure all the men necessary to keep the mines in safe running order.

Sydney.—The McKay Coal Mine now being opened up between Sydney and North Sydney, employs about forty men. The output, between 40 and 50 tons per day, is distributed along various points on the I. C. R. in Cape Breton.

Port Morien.—The Gowrie and Blockhouse collieries, recently taken over by the North Atlantic Collieries Limited, are being put into good shape. Overground the miners' cottages, the power house and bankhead, are being repaired. A pipe line of water supply is to be laid to Sand Lake. Under the supervision of P. J. Leslie, 200 feet will be added to the breakwater. The government dredge is deepening the approaches to the breakwater and the company's pier.

Halifax.—Sixty of the one hundred and thirty candidates who tried the mining examinations qualifying for the positions of manager, underground manager and overmen, have passed. Seventy of the candidates were from Cape Breton County. Thirty-three of these were successful. The other successful candidates were distributed thus: Eight from Inverness, eight from Pictou, and eleven from Cumberland. Six candidates passed the mine managers examination, Of these five came from Cape Breton and one from Cumberland.

Sydney.—No. 2 Blast Furnace of the Dominion Iron and Steel Co. was blown in on August 8th. On the afternoon of August 10th it was producing iron and was working in good shape.

ONTARIO.

Sudbury.—It is reported that the Chapin syndicate has made a first payment of $240,000 on the Whistle and other properties on the north nickle range. Mr. R. W. Demorest is in charge of the prospecting.

Sault Ste. Marie.—The contract for the construction of the short line of railway from the Algoma Central to the Superior Copper Company's mine, has been awarded to the O'Boyle Brothers Construction Company. The line will run for five miles in a westerly direction from the 38 mileage post of the Algoma Central. It will be completed in one year at a cost of about $100,000. It is probable that the ore, to the amount of two hundred tons per day will be shipped to the new smelter of the Bruce Mines Company.

Reports have come in to the effect that J. B. Miller has discovered a large deposit of nickel ore near Washington.

Cobalt.—The King Edward Mine and the Colonial have started work again. Both of these mines were shut down on account of the strike.

On the Trethewey mine a diamond drill is down 580 feet. Several veins, one of which is silver-bearing, have been cut.

A rich eighteen inch silver vein was recently cut on No. 1 shaft of the Buffalo mine.

Chief Justice Falconbridge on August 14th, granted an interim injuction, valid until August 29th, restraining Cobalt Branch 146, of the Western Federation of Miners, and certain of its officers and members, from interfering with the men employed by the Buffalo Company.

Bulletin No. 3 issued by the Foster Cobalt Mining Company is encouraging. Vein No. 6 has widened. Veins No. 5 and 8 are showing up strong at the 70-foot level. A car of No. 1 ore recently shipped netted $28,500.

The machinery for the new concentrator plant of the Cobalt Central has been shipped. It is hoped that the plant will be in operation in October.

ALBERTA.

A C. Flumerfelt, President of the International Coal and Coke Company of Coleman, and of the Alberta Coal Company of Lundbreck, and N. H. Galer, vice-president and general manager of those companies are opening a new mine, the third coming under their control. They have organized the Royal Collieries Ltd., and have acquired the Barnes Mine, five miles from Lethbridge, together with 600 acres of coal land. The Barnes mine has heretofore been operated on a small scale. The new owners will install a large and modern plant.

Between eighty and ninety employees of the Alberta Railway and Irrigation Company, at their Galt Mines, Lethbridge, refused to go to work on August 12th. The men affected were the drivers, shiftmen and grippers. The drivers claimed that their time started when they harnessed their horses, while the company claims that their "working place" is where they hitch to the car in the mine. The men in striking acted against the advice of the union officials. The men returned to work on August 14th, pending an investigation.

BRITISH COLUMBIA.

Boundary.—Six machine men were added to the force of the Cariboo-McKinney mine this week.

Both the Granby and the B. C. Copper Companies are operating their furnaces with practically no reserve of coke. Apparently the railways are quite unable to handle a sufficient and regular supply. The Dominion Copper is running smoothly.

The foundations for the fifth giant ore crusher to be installed by the Granby Company, are now complete. The crusher is being placed at their Gold Drop mine.

Cariboo.—The Thistle Mining Company began piping this season on May 9th. Until June 20th they ran double shift. After that date there was only enough water for a day shift. About 22,500 car loads was moved. A bank-blast of 4,000 pounds of black powder is to be put in this autumn and the shattered ground will be piped with the fall freshet water.

The bedrock clean up of the Alabama Hydraulic, on Mosquito Creek, was over 400 ounces. The sluice flume is expected to yield from 30 to 50 ounces.

Phoenix.—A very serious cave-in occurred on the evening of August 12th at the Brooklyn mine of the Dominion Copper Company. The cave-in happened at 7 p.m., and, fortunately, there were no men in the mine at the time. The shaft is intact, but the ore-bunkers and waste-dump have dropped down below the 200-foot level. Shipping was delayed only a few days. No lives were lost.

Vancouver.—The Guggenheims have placed an order with a local firm for five hundred tons of general provisions to be shipped immediately to Dawson. The supplies are for their mining camps on the Klondike Creeks.

Mr. E. Lindeman, who was sent by the Federal Government to investigate the iron ore deposits of Vancouver Island, is on the west coast. He will make magnetic surveys of Sechut and Sareta, visiting also Kennedy Lake and Head Bay on Nootka Sound and Quatsino, and spending about a month around Barkley Sound. He will also make a trip to Texada Island.

Gold, silver and copper are reported on a mineral discovery at the confluence of the Skeena and Ecstall Rivers, near Port Essington.

Victoria.—The steamer Princess Beatrice brought to Ladysmith on August 14th, the first shipment of ore from the Queen Charlotte Islands, to the Tyee smelter. She carried 300 tons of copper ore from the Ikeda Bay mine.

Ladysmith.—On account of the large increase in the smelting business, the Tyee Copper Companys smelter at Ladysmith will probably be doubled in capacity. Shipments are received not only from Company's mine at Mount Sicker, but also from many mines in Alaska, the Yukon, and from other districts on the Pacific. From the Ikeda, and other mines on the Queen Charlotte Islands, shipments are expected.

MINING NEWS OF THE WORLD

UNITED STATES.

The report of the Calumet & Hecla Co. for the fiscal year ending April 30th has just been published. It states that during this period 46,949 tons of refined copper were marketed, while the assets are placed at $8,757,444 and the liabilities at $1,728,942, leaving a balance of $7,028,942 to profit and loss. Dividends aggregating $6,500,000 were paid dur. ing the year. The company in extending its field of operations has secured options to Nov. 20th, 1907 for the examination of the Mamainse and Pointeax mine lands in Canada on the eastern shore of Lake Superior.

The Amalgamated Copper Co. has placed its stock on a regular 8 per cent. per annum basis. This rate was originally guaranteed but was probably not maintained in consequence of expensive law suits. The Company has paid to date since its incorporation in April, 1899, the large sum of $52,618,504. The outstanding capital is $153,877,900.

The Grant mine, in Washington, under option to the B. C. Copper Co. of Greenwood, B.C., is being actively operated and a 10-drill compressor has been installed with a view to increasing the monthly output to a thousand tons.

The coal production of the State of Wyoming for the year 1906 was, according to a recent report of the U. S. Geological Survey, 6,133,994 short tons, valued at $8,013,523, a considerable increase over the preceding year. Wyoming now ranks second among the coal producing states of the Union in point of tonnage produced per man employed. The majority of the mines work ten hour shifts.

As a result of the labor troubles at Bisbee early in the year, and now like disturbances at Clifton, copper production from Arizona in 1907 is, it is thought, not likely to show an increase.

The annual report of the Utah Copper Co. now in course of preparation is likely to prove of great interest. This company is mining at a cost of 45 cents a ton, or with taxes and administrative charges added, not in excess of 68 cents, while it has fifteen miles of underground workings and forty million tons of 2 per cent. and sixty million tons of slightly lower grade copper ore blocked out.

The admission is made in the report of the Pennsylvannia Department of Mines for 1906, that the increase in the number of inspectors has had no appreciable effect in decreasing the number of accidents in coal mines. In fact in comparison with other fields the reverse is shown to be the case.

AUSTRALIA.

The affairs and finances of the Zinc Corporation appear to be in somewhat of a muddle. The Company purchased large stocks of Broken Hill tailings which it was expected could be profitably treated; and first the Potter process and then another method was tried without success and now the Elmore vaccum process is being tried. Meanwhile the company has come to the end of its resources and proposes to issue new capital in the shape of preference shares.

Australia's mineral production in 1906 was valued at $40,848,120, or an increase of nearly five and a half million dollars over the previous record achievement of 1905. The chief product, of course, was gold. Australia had produced to the end of 1906 minerals to the value of $862,801,910 since mining was inaugurated in the Commonwealth. The number of persons employed in mining during the year was approximately 42,500.

Both cemeteries at Ballarat, says a correspondent, to the London Mining Journal, are located on lode-bearing bedrock, and under a slight capping of clay soil quartz lodes and veins are found. At Buninyong, oldest of resting places in the Ballarat district, where gold was first discovered in 1851, gold miners long ago sought a lead under the cemetery, while the old cemetery in Ballarat is right on the line of some quartz lodes proved to be very valuable. Recently during a funeral the mourners noticed gold in the gravel dug from the grave, and obtained permission to test some few hundred pounds of it in a mill. The sample yielded at the rate of 2 oz. to the ton. We fear, however, that this last story is just the least bit "tall."

SOUTH AFRICA.

It is reported that at the present time the supply of native labor is actually greater than the demand for the mines of the Transvaal. The great trouble with the Kaffir as a miner is that, while he is tractable and willing, he will only remain at work for a comparatively short period of time, which of course seriously interferes with his becoming efficient. For years past the mines have attempted to instill into the natives the advantage of the piecework system, and it is in this direction that the greatest hope of rendering native labor efficient lies. Meanwhile it is satisfactory to learn that the strike of white miners on the Rand has been declared off, and the Government has induced mine owners to reengage many of the men on the old terms pending the report of the Mining Commission. Notwithstanding the strike a considerable increase in the mineral production of the Transvaal for the first six months of the present year is to be noted, the total value of the output for this periodbeing placed at £30,729,831.

CHINA.

In his report for 1906, the Commissioner of Customs at Tientsin states that the mines of the Chinese Mining and Engineering Company, while no longer the only source of coal supply in North China, continue to occupy the first place. The total output of these mines last year amounted to 958,675 tons, of which a large proportion was used on the railways.

INDIA.

In Burma the only working coal mine is situated in the Shwebe district, and here operations were recently suspended. Excellent coal, however, is found in the Upper Chindwin district, but at present too far away from all lines of communication to be workable.

The gold production of India for the first six months of this year amounted to 268,211 ozs., as against 292,956 oz. for the corresponding period of 1906. Of the tota, this year the Mysore Mines contributed 102,436 ozs.; and the Champion Reef 64,204 ozs.; the remainder being reported by the Oregum, Nundydroog and other mines.

RUSSIA.

The British Consul at St. Petersburg reports that the output of coal from the South of Russia for 1906 to have been 11,340,479 tons.

SWEDEN.

The condition of the Swedish iron market remains good, and the export continues to show satisfactory figures, which for the most descriptions exceed those of last year at the same time. The shipping of pig iron for January to May amounted to 34,000. Prices have kept at about the same level namely £5 10s. and £5 5s. per ton, f.o.b. shipping port, for iron of not more than 0.020 per cent. phosphorus.

STATISTICS AND RETURNS

On Shipments for the week ending Aug. 3rd, for the undermentioned districts of Britieh Columbia stand as follows :

	Week.	Year.
Boundary	30,567	675,234
Rossland	4,140	161,998
Slocan-Kootenay	3,025	76,746

The total shipments from the mines in the above districts for the past week were 37,732 tons and for the past week were 37,732 tons and for the year to date 913,978 tons.

For the week ending July 27th :—

	Week.	Year.
Boundary	37,573	644,667
Rossland	6,788	157,858
Slocan-Kootenay	2,987	71,721
Total	47,348	876,046

Following are the weekly shipments from Cobalt camp :

	Ore in lbs. Week Ending Aug. 10.	Ore in lbs. Since Jan. 1st.
Buffalo	60,000	1,398,830
Nipissing	64,360	3,155,438
Silver Queen	176,000	652,157

The total shipments for the week were 300,360 pounds, or 150 tons.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date :—

	Ore in lbs. Week Ending Aug. 17.	Ore in lbs. Since Jan. 1st.
Buffalo	60,000	1,458,830
Coniagas		4,080,180
Cobalt Central		101,360
Colonial		74,250
Drummond		44,090
Foster		192,350
Green-Meehan		196,780
Hudson Bay		45,170
Kerr Lake (Jacobs)		249,000
LaRose	43,000	978,302
McKinley		188,000
Nipissing	296,808	3,452,246
Nova Scotia		96,000
O'Brien		2,220,254
Red Rock		40,000
Right of Way		134,530
Silver Queen		652,157
Silver Leaf		43,518
Trethewey		1,346,018
Townsite		84,078
Temiskaming	119,011	229,011
University		61,383
Imperial Cobalt		37,530

The total shipments for the week were 518,819 pounds, or 259 tons.

The total shipments since Jan. 1, 1907, are now 15,935,845 pounds, or 7,968 tons. In 1904 the camp produced 158 tons, valued at $136,217 ; in 1905, 2144 tons, valued at $1,473,196 ; in 1906, 5129 tons, valued at $3,900,000.

For the week ending August 10th the ore shipments in South Eastern British Columbia were seriously curtailed. The coke shortage has caused a temporary shut down, and the smelters are suffering from a congestion of ore. Following are the figures for the week :—

Shipments.	Week.	Year.
Boundary	31,560	706,794
East of Columbia River	2,640	79,350
Rossland	3,673	165,671
Total	37,873 tons	951,815 tons.

Smelter Receipts.

	Week.	Year.
Grand Forks	15,843	381,086
Greenwood	8,976	204,470
Boundary Falls	5,797	104,489
Trail	4,974	138,961
Nelson	25	10,048
Northport	155	61,762
Marysville	600	19,200
Total	36,370 tons	920,016 tons.

CROW'S NEST OUTPUT.

The output of the Crow's Nest collieries for the week ending Aug. 16 was 22,793 tons, a daily average of 3,799 tons.

New Dividends

NEW DIVIDENDS.

The directors of the Intercolonial Coal Mining Company, Limited, have declared a half-yearly dividend of 3½ per cent. on preferred and 3 per cent. on common, payable Sept. 2. In 1906 the company paid 7 per cent. on the preferred and 7 per cent. on the common.

Catalogues and other Publications Received

The International Metallurgical Company, El Paso, Texas, in a 15-page pamphlet advertise the "W. Townsend Smith Patent Improved Metallurgical and Cyanide Process and Apparatus." In a summary of advantages the following strong claims are made :—

1. A saving of 30 per cent. to 60 per cent. of the installation cost of a cyamide plant.

2. An increased extraction of gold and silver over any other process, with less time of of agitation.

Elimination of stirrers, pumps, etc., saving in labor, large increase of capacity, saving in power, economy of room, elimination of filter presses are also among the good features of this new method. The process is certainly worthy of examination. If the manufacturers are able to substantiate their claims, they need have no fears for their success.

The Illustrated and Priced Catalogues of Assayers' and Chemists' Supplies for sale by the Denver Fire Clay Co., Denver, Colorado, U.S.A., 1907.

This catalogue describes the standard varieties of laboratory apparatus. Of especial interest are the muffles made by this company. Shape 4, with square sides, is a departure from the traditional muffle. Its design implies increased capacity and far greater convenience in removing and placing crucibles. The double-muffle assay furnaces are of particularly strong and simple construction. A fine range of button balances is illustrated.

Catalogue No. 6 C. "Stamp Milling Machinery," issued by the Colorado Iron Works Company, illustrates many types of mortars, and gives a description list of all necessities of the stamp-mill. 12 pages of the publication are devoted to an excellent article on "Gold Amalgamation."

A special catalogue (No. 20) published by the Ingersoll-Rand Company, 11 Broadway, New York, describes the Temple-Ingersoll Electric Air Rock Drill. This new device marks a radical departure from both the standard air drill and the hitherto tentatively accepted electric drill. It is free from the essential limitations of both. Its manufacturers claim that it has been thoroughly "tried out" under actual working conditions. If the machine lives up to its claims it will revolutionize the whole work of winning ore. So far its claims have received substantial endorsation from a considerable number of users in the United States. There will appear in the Canadian Mining Journal further information concerning this machine.

Bulletin No. 10 of the Cleveland Pneumatic Tool Company, Cleveland, O., tells of the "Cleveland" No. 10 and No. 20 Drills. No. 10 will drill holes up to 1½ inches in diameter and 4 feet in depth from six to twelve inches per minute. It weighs 20 pounds and uses 15 cubic feet of free air per minute. No. 20 weighs 23 pounds and requires 20 cubic feet of air. It drills holes up to 2 inches in diameter and 6 feet deep. "Cleveland" drills have no small, easily broken outside fittings, valves or locking devices.

The Tyee Copper Co., Limited.

The eighth ordinary general meeting of this company was held in London last month. The Chairman stated that during the year £12,532 had been spent in prospecting and development, and this and a further sum of £3,321, had been paid out of revenue. Maintenance, repairs and depreciation at the mine and shelter amounted to £4,789, only 10 per cent. having been written off for depreciation as 25 per cent. had been allowed on this account last year. The credit side of the profit and loss account explained itself and enabled the directors to recommend the payment of a dividend at the rate of 7½ per cent. per annum free of income tax. Although the "long looked for ore-body" had not yet been found, the local director, Mr. Clermont Liverston, is still hopeful that the search will succeed; while the company's smelting business had considerably improved from the opening up of copper mines in Alaska, the Yukon Territory and on the Pacific Coast. In view of this improvement the company has under serious consideration doubling the capacity of the smelting works at Ladysmith.

Output of the Dominion Coal Company for July was 312,815 tons, which was 14,000 tons than the output for June. This is how the year's figures look so far:

January	252,107
February	226,190
March	205,134
April	316,114
May	526,170
June	326,914
July	312,815
Total	1,964,494

Output Dominion Coal Co. for the first fortnight of Aug.:

No. 1	20,400
No. 2	26,560
No. 3	15,020
No. 4	20,130
No. 5	28,320
No. 6	8,770
No. 8	9,810
No. 9	10,800
No. 10	3,660
	143,470

The output for the first half of the month was small, several minor delays being experienced. The P. W. A. held their Annual Picnic at Sydney Mines on the 10th August, and the collieries generally paid on the 9th. The amount of money disbursed through the pay rolls was the largest on record both at Sydney Mines and at Glace Bay. During the remaining portion of August the output will continue to improve, and will fully equal and possibly more than equal for the same period of last year.

NEW DIVIDENDS.

The International Coke and Coal Company, Coleman, Alta., has declared a dividend of 1½ per cent., payable August 1st.

The British Columbia Copper Company, Limited, has declared its first regular quarterly dividend of 25 cents per share with an extra dividend of 15 cents per share, payable on September 4th. The company is capitalized at $3,000,000 in shares of $5 each. Of the shares there are 503,000 outstanding. The amount to be distributed is thus $212,000.

METAL ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—9 to 11¼ cents per lb.
Arsenic, white—7½ to 7¾ cents per lb.
Barytes, crude—$11.25 to $14.75 per short ton.
Bismuth, metal—$1.50 to $1.75 per lb.
Cadmium, metal—$1.30 to $1.35 per lb.
Carbons for drills—$75 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—25 to 40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$15 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$50 to $80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 90 per cent. pure—$4.50 to $5.00 per unit.
Nickel, metal—45 to 65 cents per lb.
Platinum, ordinary metal—$28 per ounce.
Platinum, scrap—$21.50 to $22.50 per ounce.
Pyrite—38 to 45 per cent. sulphur, lump ore, 10¼ to 11½ cents per unit.
Quicksilver—$40 to $41 per 75 lb. flask.
Sulphur—$23 per long tin.
Talc—$18 to $23.50 per tin.
Tungsten, pure metal—$1.25 per lb.
Tunsten ore, 60 per cent. pure—$9 per unit.
Tin—37 cents per lb.

MARKET NOTES.

Spelter—Light demand and weak market. New York, 5.80 cents per lb.; London, £22 7s. per long ton.

Lead—Market steady. New York, 5.25 cents per lb.; London, £19 13s. for Spanish lead.

Tin—Prices still declining. New York, 37 cents per lb; London, £164 10s. for spot.

Copper—More business doing in copper. Market not yet recovered. New York, electrolytic, 18½ cents, lake 19½ cents per lb.; London, £78 for spot standard.

Silver—Aug. 1, 69⅝; Aug. 2, 69¾; Aug. 3, 69⅞; Aug. 5, 69⅞; Aug. 6, 69⅝; Aug. 7, 69⅝; Aug. 8, 69⅜; Aug. 9, 69; Aug. 10, 68¾; Aug. 12, 68; Aug. 13, 67⅞; Aug. 14; 69½.

Mexican dollars—54⅛ cents. Sterling Exchange, $4,865.

Pig Iron—Pittsburg—Bessemer pig, $22.50; No. 2 Foundry, $23.80.

Iron Ore—Bessemer, old range, $5.00; Bessemer Mesabi, $4.75; Non-Bessemer, Old Range, $4.25; Silicious, non-Bessemer, $2.50.

Quicksilver—$41 to $42 per 75 lb. flask.

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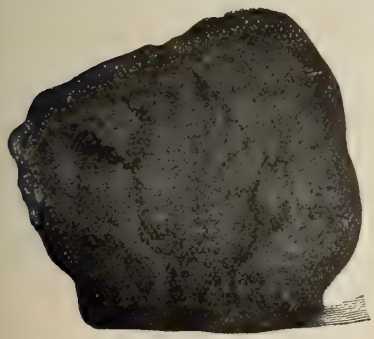
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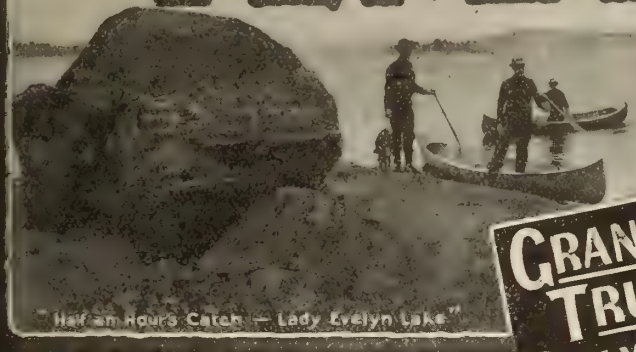
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The Handbook will appear during September. As the edition will be limited, orders should be placed at once. The price is One Dollar.

THE CANADIAN MINING JOURNAL

I. No. 13 New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 15



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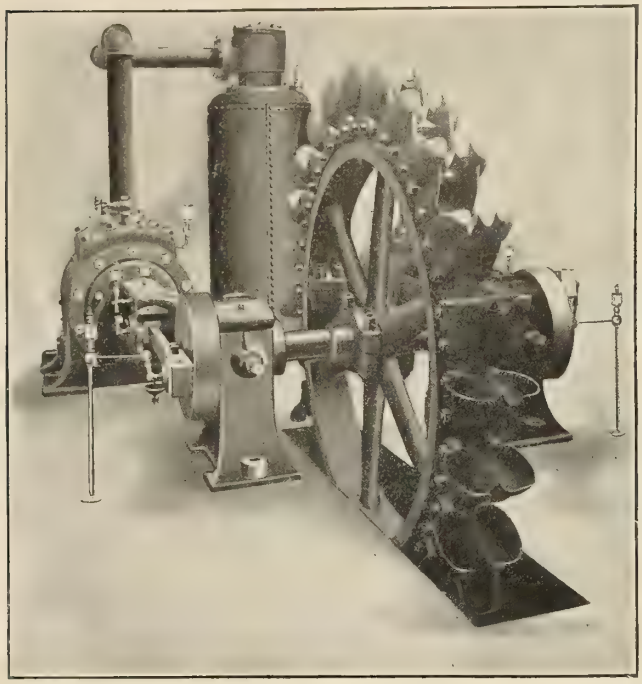
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BUYERS' DIRECTORY - - - - - XXX

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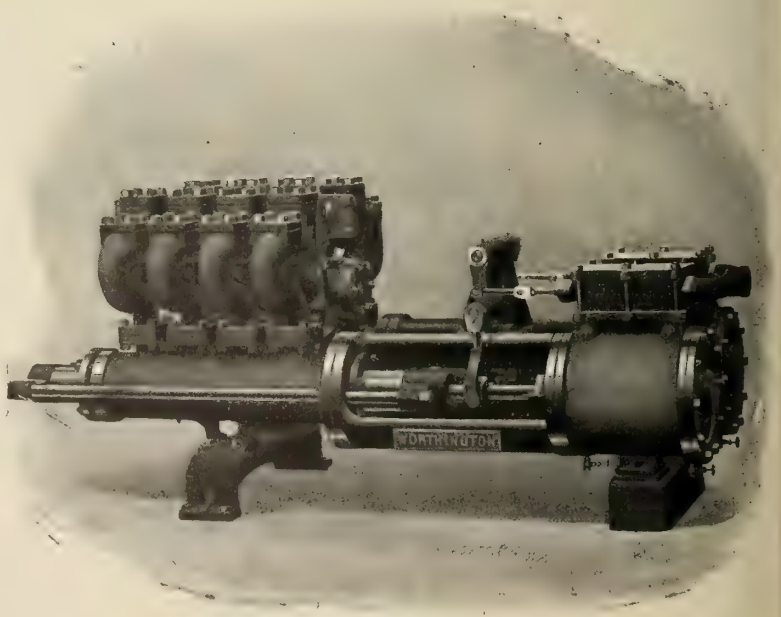
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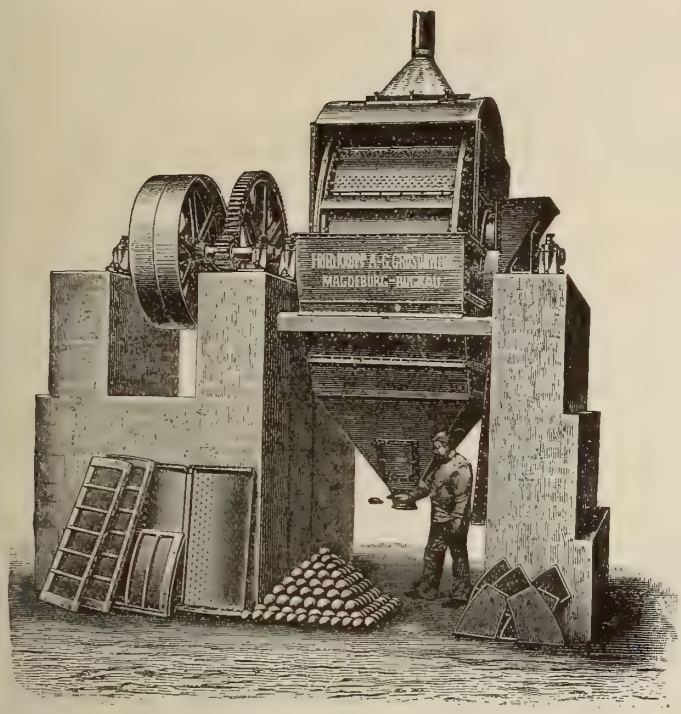
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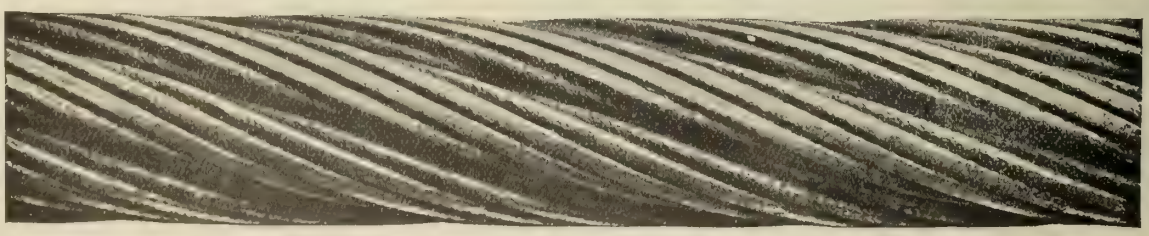


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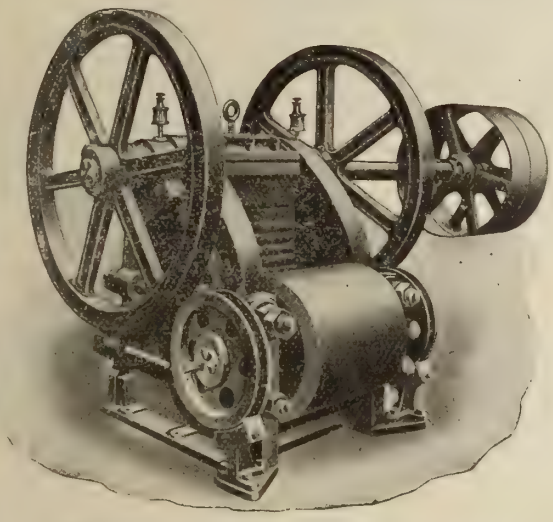
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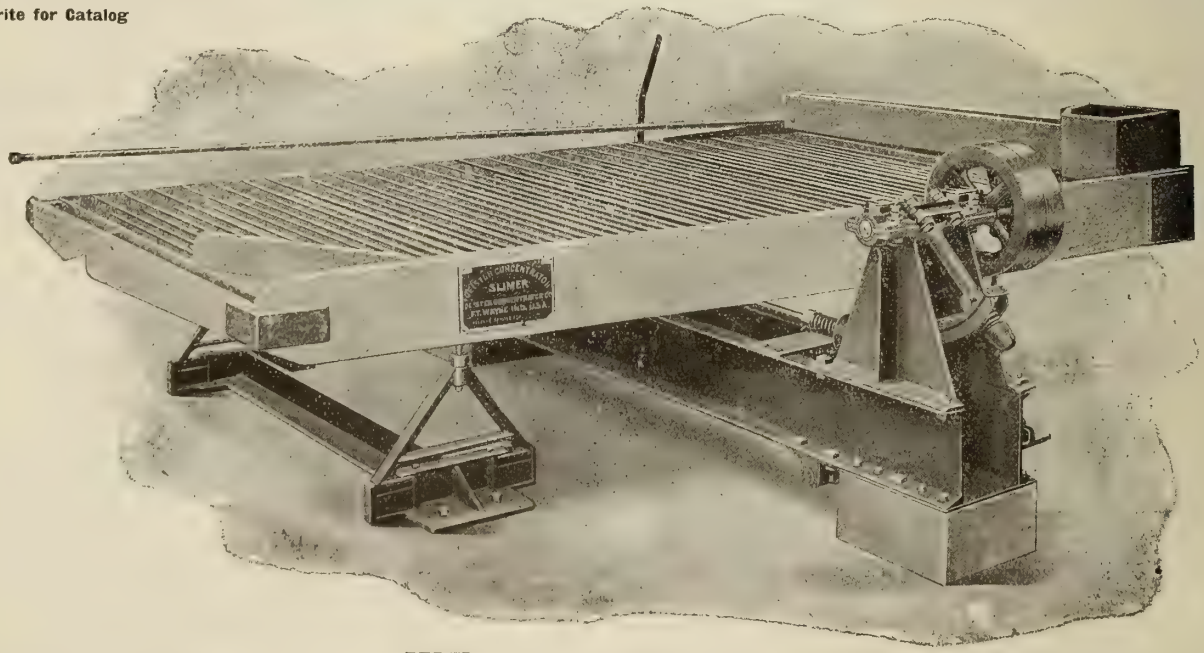
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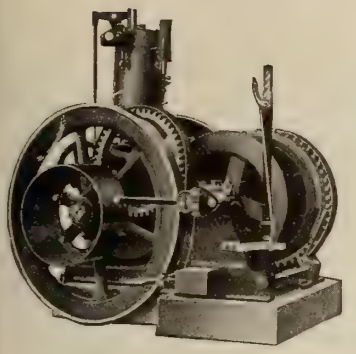
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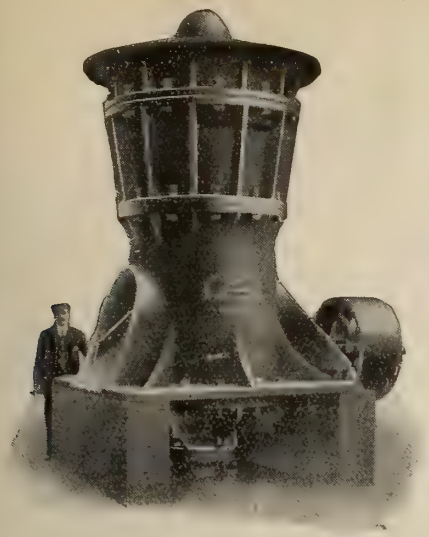
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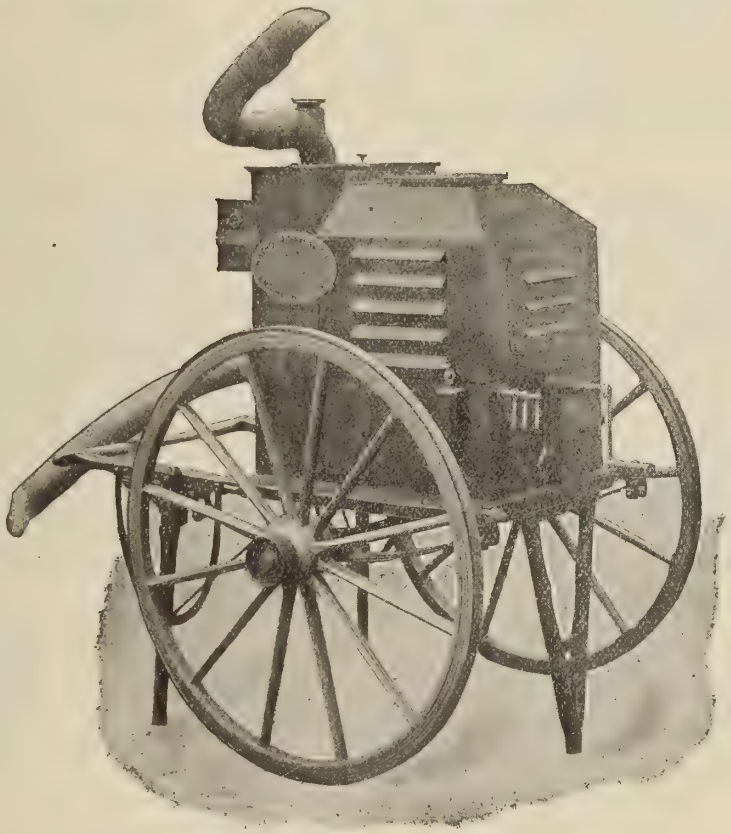
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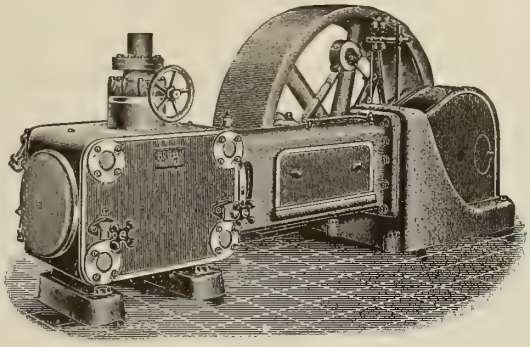
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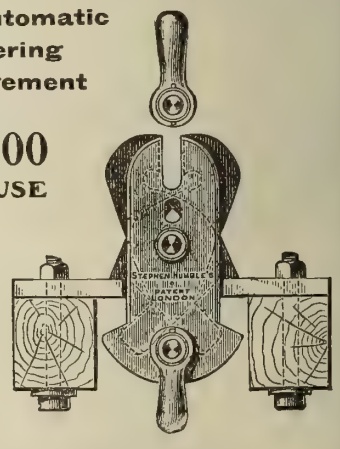
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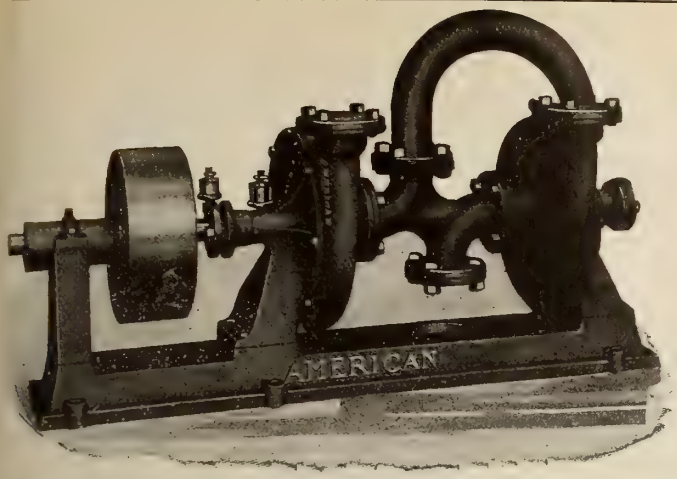
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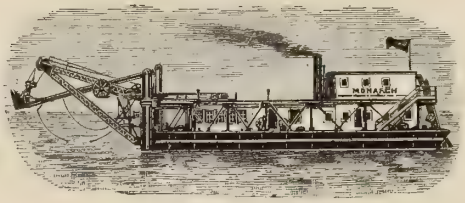
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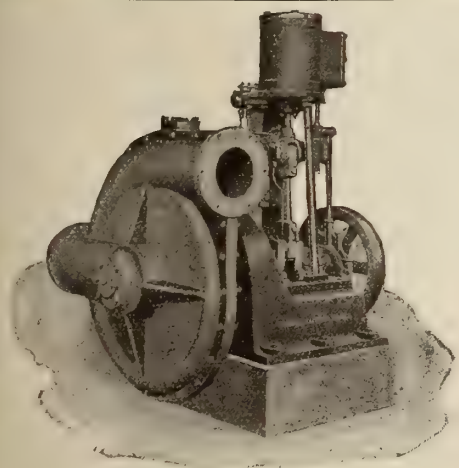
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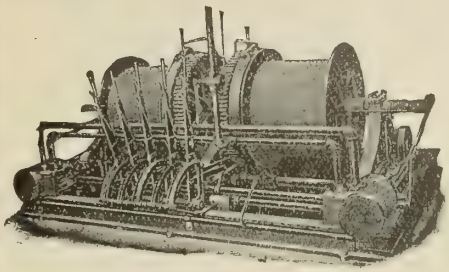
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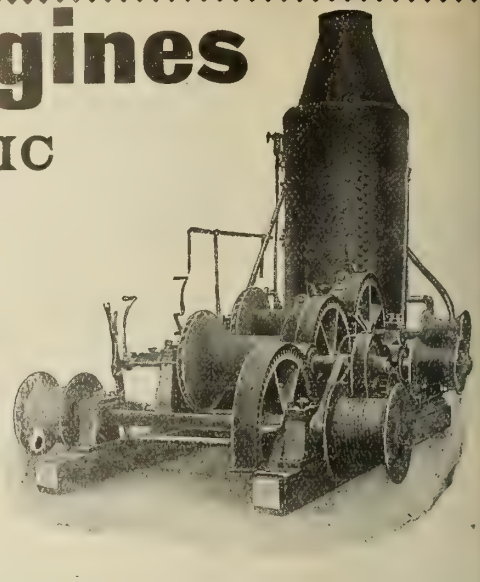
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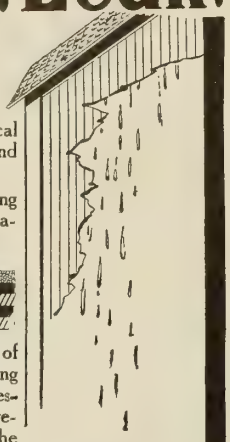
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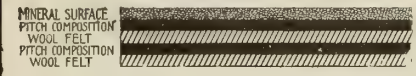
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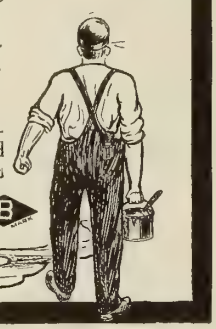


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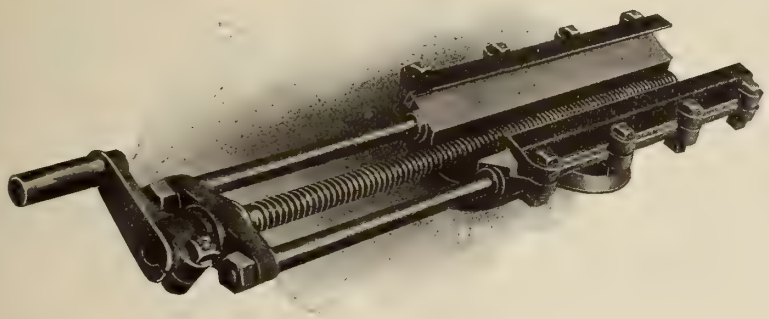
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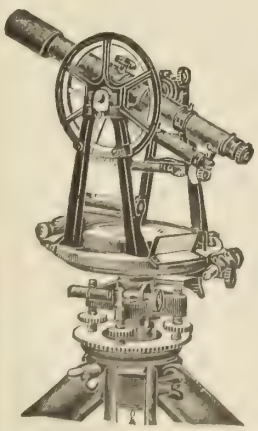
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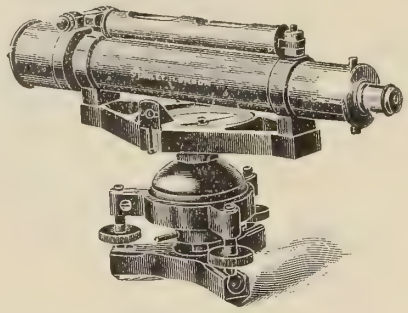
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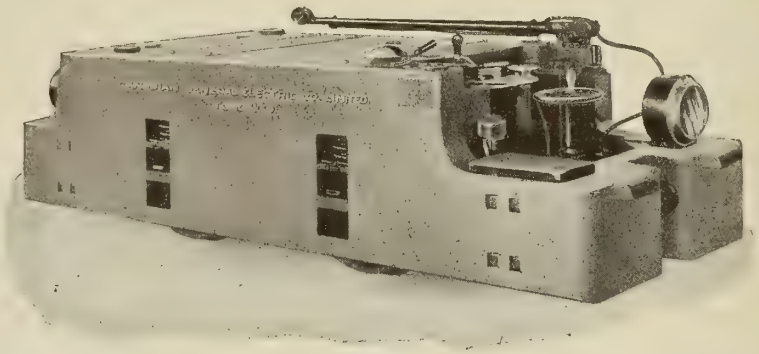
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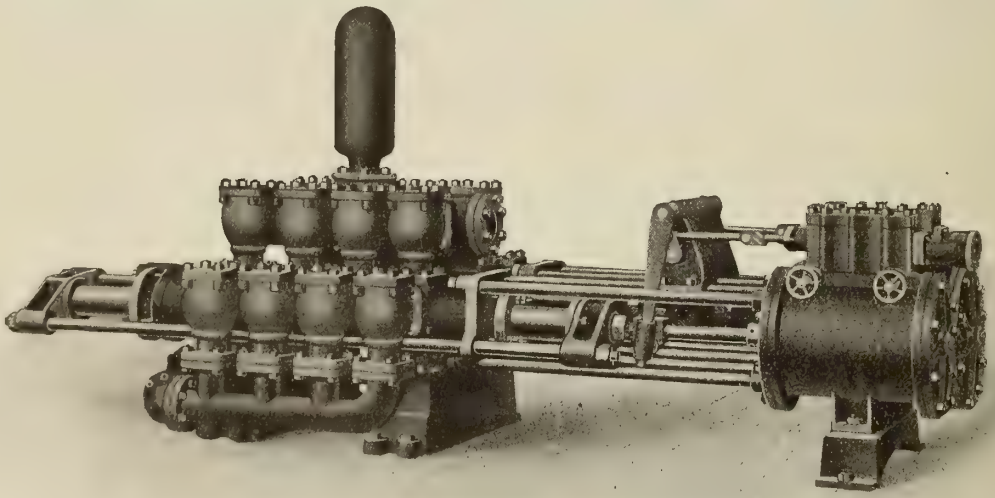
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CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

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STAKING CLAIMS

A subscriber has brought to our notice some irregularities in the staking and recording of claims in Northern Ontario.

In the Diabase Lake District a group of prospectors staked out eight claims of forty acres each, not only before making a discovery upon the territory so staked, but before they had even prospected the ground. The average prospector will not interfere with areas which have been staked. Therefore this particularly vicious form of blanketing practically secures large holdings in defiance of the express and explicit requirements of the law.

In James Township, claims thrown out by the Government Inspectors have been promptly recorded by other parties, who have dispensed with the preliminary necessity of prospecting and have sworn to fictitious discovery. This last practice is far too common.

We quote the above instances because we believe that the honest prospector should assuredly have fair play. There are many men who cannot bring themselves to swear to an imaginary discovery. These men suffer for the sins of less scrupulous persons. A few prosecutions for perjury would clarify the situation.

PROSPECTORS' MEETINGS

From several quarters has come the request that we should give more of our space to the prospector. The request is fair, but the prospector himself is elusive. His elusiveness exceeds our willingness to comply with his desire. Our columns are always open to the complaints or questions of the prospector. We hold him in especially high esteem, for we know something of him.

His grievances are largely based upon those features of our mining laws which, in his opinion, militate against him. From Ontario we have had many verbal complaints —from Quebec a greater number, couched in language more vehement.

We wish to proffer a suggestion. It would be an excellent thing if, in places like Sudbury, Cobalt, Marmora in Ontario, and suitable points in Nova Scotia, Quebec, Alberta and British Columbia, gatherings of prospectors could meet and discuss the mining laws of each Province. In the laws of every Province there are bad and good features. In Nova Scotia and British Columbia the prospector has, perhaps, the fairest treatment. In Ontario, while the administration of the law is honest, discreet and equitable, yet the law itself gives rise to some anomalous and distressing complications. But the Government has openly professed its willingness, its real desire, to improve and simplify the present Mines Act. The

growling of sore-headed individuals does no good. What is needed is the clear expression of opinion from a representative gathering of prospectors.

We would suggest then, as an opening move, that during the coming fall a meeting of prospectors be held at Cobalt or Haileybury. A convenient time would doubtless be after the first fall of snow. A meeting of this kind would clear the atmosphere. Resolutions drafted by a company of bona fide prospectors would receive most respectful consideration from the Provincial Government. We predict also that at least half of the grievances now current would evaporate.

AN IRON INDUSTRY FOR BRITISH COLUMBIA.

The flotation of an organization, to be capitalized at $15,000,000, is being undertaken by British financiers. The erection of large iron and steel works, with many subsidiary plants, will follow the successful promotion of the company.

If the promoters are thoroughly in earnest—and there is no reason to suppose them otherwise—they will, doubtless, receive all possible encouragement and support from the Province. A sound and progressive iron and steel industry is more to be desired than mountains of silver and gold. To British Columbia it would impart a stability not otherwise obtainable. When our Pacific Province becomes self-supplying in the items of coal, iron and steel, she will have added many cubits to her stature.

COBALT AND OTHER THINGS

The depreciation in Cobalt stocks is significant of two movements. Firstly, the public is fast losing confidence in many of the more heinous flotations, and as a consequence the mining broker's calling and election are sure no longer.

Secondly, a strong reaction is setting in at Cobalt itself. Prospects and mines that were merely started as pretexts for profitable promotion are rapidly finding their level—and it is a low level. The sounder enterprises are pushing vigorously ahead. The true test of "results" may very fairly be applied now to all but the most recently staked properties.

Incidentally there is a most apparent tendency towards the promotion of smelters and reduction plants. Apart from plants erected by private enterprise, there are several proposed smelters whose promoters have appealed or will shortly appeal to the public. In subscribing for stock of this sort every precaution should be used. The reduction of Cobalt's ores will not be a simple process. Much time and money will be spent before their treatment will have been standardized. Therefore it is but ordinary discretion to look askance upon the large promises of any proposed smelting concern.

A PAINFUL DUTY.

The activity of promoters of mining companies, especially in Cobalt and Larder Lake, has been most pronounced of late. Strong efforts are being made to dispose of stocks whose value is problematical, if not quite negative. The Canadian Mining Journal believes that it will best serve the interests of the districts mentioned and of the public, if, taking available facts and prospectuses as a basis, comparisons are instituted between the promises and the performances of these promoters.

In the course of our enquiries we have discovered that many companies have either not complied with or have evaded a large number of the requirements of the Companies' Act of Ontario. These omissions we shall point out. We shall also state without fear or favor our unqualified opinion of various flotations.

It is a most distasteful duty. But a duty it most undeniably is. We owe it to our subscribers, for the benefit of whom we live and move and have our being.

The current number contains the initial article of a series, which, we hope, will lead to a new interpretation of the obligations of the promoter to the public.

EDITORIAL NOTES

Errors creep into our columns despite our honest and painstaking efforts to eliminate them. In the last issue Dr. Haanel was referred to as Director of the Mines Department. This is inexact. Dr. Haanel is Director of the Mines Branch. A letter published in this issue sets the matter right.

The Secretary of the Toronto Branch of the Canadian Mining Institute announces that there will be a meeting of the members of this branch on Thursday evening, October 10th. The place of meeting will be announced later. The object of the meeting is the discussion of the Mines Act and the drafting of recommendations as to changes in certain sections of the Act. The recommendations are later to be respectfully submitted to the Minister of Mines for Ontario.

The world still has a considerable supply of coal. Germany is credited with 28,000,000,000 tons, sufficient to last 2,000 years at the present rate of consumption; Great Britain and Ireland claim 193,000,000,000 tons, with an annual consumption about double that of Germany; Belgium has 28,000,000,000 tons; France, 19,000,000,000; Austria, 17,000,000,000; and Russia, 40,000,000,000. North America is believed to have 681,000,000,000,000 tons, more than the total of the other countries named. It is the tremendous increase in the use of coal that justifies alarm, for, while the supply of the United States would last 4,000 years at the rate of consumption in 1905, it will be exhausted within a century if the rate of increase of the last 90 years continues. No estimates of the coal of other parts of the world can be made, but Asia is known to have an enormous store.

SPRINGHILL AND ITS COLLIERIES.

W. D. Matthews.

Before entering upon a description of these collieries, it may not be out of place to give some idea of the lay of the coal seams at present being worked. There are three seams, viz., north, east and west, or as numbered, 3, 1 and 2. No. 3, the overlying seam of the series, is separated from No. 1 by 300 feet of intervening strata. No. 1 is separated from No. 2 by about 100 feet of rock, No. 1 coming in between 2 and 3. The seams run parallel, though differing greatly in places, as to dip, this difference running all the way from 20 degrees to 80 degrees. The Cumberland coal field is an extensive one. Coal has been found all over the country. It is generally conceded, however, that the Cumberland Railway & Coal Company has the best of it. Outside of their holdings it is doubtful if the remainder possess any great value. Just how many seams of economic value there are in the Springhill basin is a matter of conjecture. Exhaustive prospecting has been done over this section by some of Canada's best known engineers, surveyors and geologists, and much has been written, worthy of reading, about the



No. 2 Colliery—Town of Springhill in background.

Cumberland coal fields, but the findings, so far as the writer knows, have never been particularized. The Cumberland Railway & Coal Company is operating the three known largest seams from two slopes. No. 3 seam, 11 feet high to the west of the main slope, which is split by a local stone, gradually thickens towards the east from the main slope till in two thousand feet a tunnel one hundred and fifty feet is required to connect them. No. 1 seam is similarly split to the east. The height of this seam is identical with that of No. 3. No. 2 seam is more uniform in height, varying but two feet from east to west, embracing some three miles of workings across seam. The highest, 10 feet 6 inches, which includes two-thirds of the entire length of the level.

The north, or No. 3, the overlying seam of the three, is a very excellent seam of coal, except to the extreme west of the mine. The coal is hard, clear and bright, rich in carbon, carrying a low percentage of ash with an infinitisimal quantity of sulphur. To the west this seam maintains a height of 11 feet to the boundary, nine thousand feet west of the main slope. The east lines do not reach so far. The system adopted in working this seam is bord and pillar. There is a method pursued in this mine, and in the other in a measure, not usual in mining as a rule. Levels are driven off slope at a distance of two hundred yards to the deep. The upper level is driven to the boundary, which in this case is recognized as the limit of haul. The back airway is then driven to connect with the return airway above. A pillar 30 yards thick is left to protect this air course. Then, by bord and pillar working back towards the slope, the whole lift is cleaned out, leaving but a worked-out goaf behind. This method has been very successful over some of the most difficult ground that ever confronted miners, or operators. The pitch of the seam ranges all the way from 45 degrees to vertical, with frequent faults and rolls throughout the entire section. While the upper lift is being drawn, the lower levels are being driven to the boundary. When this is reached the lift is worked back to the slope by the same system, so that there is always one or more lifts being worked back while the lower levels are being driven in. The following figures will some idea of the extent of



No. 2. Slope.

the workings in this mine. The present highest working level is 2,600 feet from the surface. It extends west 9,180 feet—seam 10 feet to 11 feet high. East levels, under seam, 2,745 feet. East level, top seam, 2,160 feet. The lift below 3,200 feet from surface level extending west 9,420 feet. East level under 2,280 feet, viz., 11 feet west and 4 feet 6 inches each of the east seams, or simply the west section of seam split by an intervening local stone.

The 3,800 foot level is practically untouched, except by the cutting of airways and haulage ways. The levels are now in over 6,000 feet. The upper level will be the main airway and drainage level. These levels are still driving. The slope in the meanwhile being sunk for a new and greater lift. It has now reached a depth of 4,500 feet, and 250 feet further is to be added before the levels are broken away. This will give a thousand foot lift. This lift with level driven to the limit of 9,500 feet gives 9,500 x 1,000 feet x 10 feet, or approximately three and a half million tons of coal in the west from the opposite or east section in this one lift.

The 2,600 and 3,200 levels west are operated by main and tailrope haulage. The haulage engines is located at 1,300 feet from the surface and steamed from the sur-

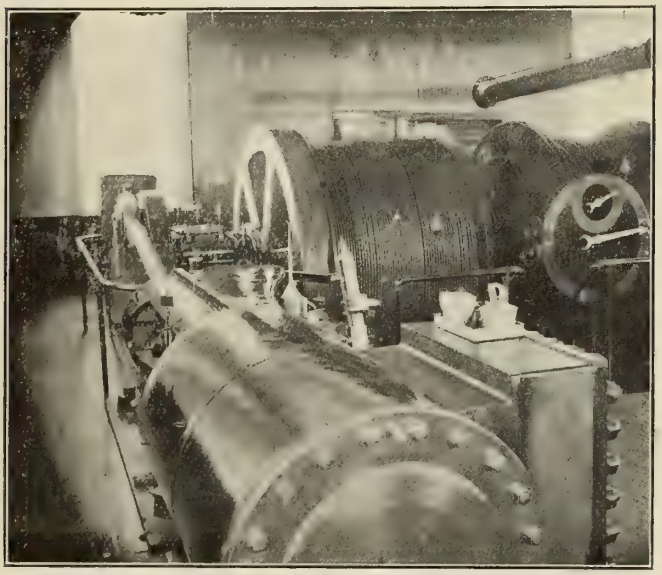
face. The east levels and west 3,800 feet are worked by horses, the number of which working at present is 22.

This mine is kept free of water by two pumps, known as the Jeansville Compound Duplex, eight hundred gallons per minute capacity, situated 1,300 feet and 3,200 feet from the surface respectively. As almost the entire drainage of the mine is caught at 3,200 feet, a small Cameron pump is used to keep the mine clear of water in the lower sinkings.

To ventilate this mine a Capell Fan 22 feet diameter, 3 feet 6 inches width of vane, with a checked capacity of 110,000 cubic feet per minute; speed, 110 revolutions, is used.

The above is the work done for ventilating purposes daily, and gives a wide margin beyond the theoretical necessities of the mine. The number of men employed is 450. The mine is not gaseous to any dangerous extent, but closed lights (safety lamps) are the rule. The Marsant is used exclusively throughout these collieries. The system of ventilating is simple but effective. No better ventilated collieries are known on the continent to-day.

The surface plant of No. 3 mine is almost perfect in its equipment. The bankhead is a model of engineering

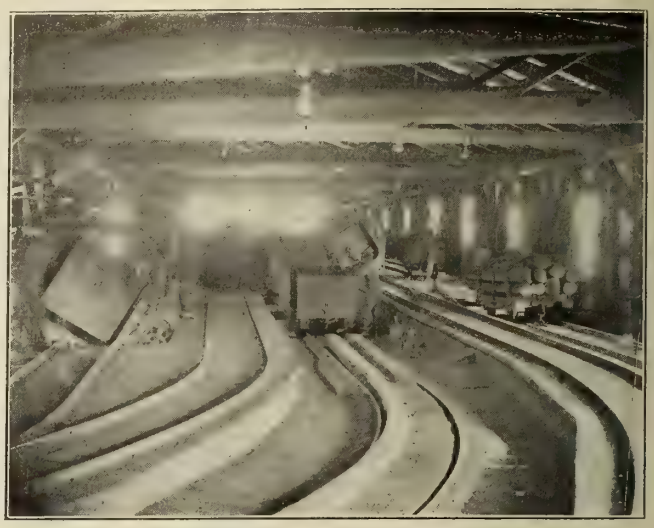


No. 2 Hoist Engine.

skill and ingenuity. There we find automatic hoists for full and empty cars, incline plants to carry the cars to certain points, automatic switches, revolving tipples, shaker screens, picking tables 450 feet in length, which carry the coal from the screens to railway cars, allowing every facility for thoroughly cleaning the coal in transit. These are capable of handling 3,000 tons per day if necessary. The whole outfit is enclosed in a corrugated iron building, and lighted by electricity. The power to move this machinery is provided by 12 boilers of the return tubular make, capable of generating 1,500 horsepower, equipped with automatic underfeed stokers, 2 Sturtevant blowers with 39 pounds pressure to the square foot. Culm is used here for firing, with good results.

No. 2 Mine—West Slope.

In the effort to describe No. 2 mine, one must needs have the bump of location very highly developed. As all the coal in seam, that is to the recognized boundaries east and west, has been extracted above the 1,900 foot lift, the visitor will find the main working bottom located 2,400 feet from the surface. The east level of this lift is worked by main and tailrope. That is, the coal from the workings is conveyed to the bottom by this method of haulage. The length of haul is 5,000 feet, the return



No. 3 Bankhead in Operation.

wheel being placed at the Aberdeen Fault, which dislocates the seam at this point, and which runs nearly parallel to the course of the main slope. Although there are two inclines, and several chutes working between the Fault and the bottom, yet the largest quantity of coal is brought by horses to the inside haulage turnout from the Aberdeen section. This section extends east from No. 5 or Aberdeen slope 400 feet to the tunnel through the fault which connects No. 2 haulage level with the Aberdeen section.

To the west of No. 5 slope the level extends 5,500 feet. Horse haulage was always employed on this level to convey the coal to connect with haulage in No. 2 slope. The quantity of coal mined east and west of No. 5 is supplemented by the coal produced in No. 5 sinking. A hoisting engine on the surface at No. 5 hoists No. 5 sinking coal to the 2,400 foot level and lands it there, whence it is hauled to No. 2 section and sent out by the rope haulage system. In the mere development of No. 5 sinking, about 500 cars of 1,800 pounds each were producer. This



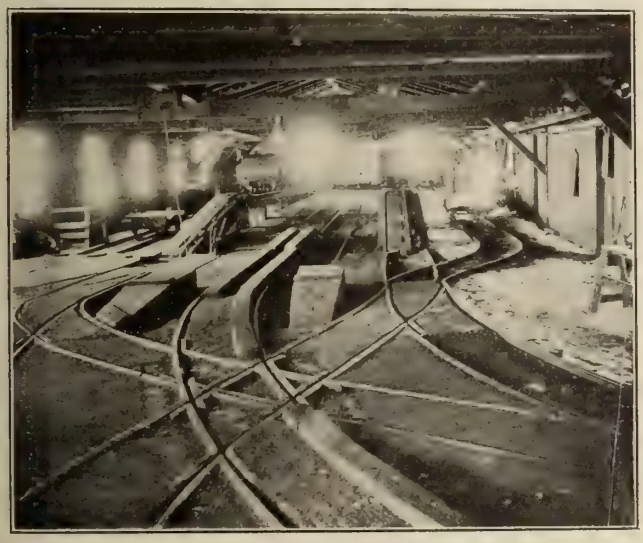
Interior of Lamp House.

coal comes from the so-called halfway level east, which extends 5,000 feet and is still being driven as a counter-level 60 feet to rise of level with necessary returns airways to 2,400 level. The lower level has been driven

from No. 5 slope some 3,000 feet. The plan of the workings is the same as above.

To the west of the halfway level is a tunnel tapping two seams. The levels extend east and west from this tunnel in each seam. The levels are being driven and other openings for ventilation are being made. This section is known as the tunnel-working halfway level. The tunnel is some 230 feet long, both seams being cut in that distance. The west lower level, No. 5, extends to No. 2 slope, 3,500 feet distant, and taps or connects with the main slope, some 200 feet from the bottom. It has lately been connected with No 2 east level by incline, by which the coal has been taken over No. 5 district and landed at the 3,600 foot bottom of No. 2 slope, a saving of haulage of two miles underground.

The clearing and sinking of No. 2 slope from the 2,400 foot level down to the present 3,600 foot level presented difficulties seldom met with in coal mines. Fifty feet below the 2,400 foot level a roll was met with that necessitated a rock cutting, after the coal was removed, of 15 feet at the highest point, and extending 200 feet down the slope. This still left the difference of grade between the length of cutting and the slope above and below it of from 8 degrees to 10 degrees. The cutting being flat in comparison, was later brought near the average grade of



No. 3 Brow of Slope.

32 degrees, by a further cutting of 4 feet out of the bottom, tapering out to a greater distance. This made the hoisting of heavy rakes possible. Before the work was quite finished a fire occurred in No. 1 slope, then working (1896-97), which put the pumps of No. 1 out of service. Nos. 1 and 1 being connected, the new section below 2,400 feet was submerged. Pumps were installed in No. 2 slope below 2,400 feet in short order, and the water was caught and held there for some years. In the spring of 1903 the work of pumping out and re-opening the submerged lower workings was begun. When the water was pumped out it was seen what a colossal undertaking it was. Falls were encountered anywhere from 10 to 50 feet high. The first fall encountered was about 80 feet long and 40 feet high on a grade of 32 degrees. Everything loose had to be loaded out, making the work extremely dangerous and slow. But experience, ingenuity and care, with unlimited material of the best quality, finally accomplished the stupendous task, without the loss of a single life. Pumps were installed at the 300 foot lodgement, which fortunately was found standing intact (except for a few insignificant falls, which were speedily cleaned up), and sinking at once proceeded below the 3,000 foot level. One hundred and twenty-five feet was sunk, when a downthrown fault was struck, displacing the seam by a drop of 30 feet vertical. A tunnel was driven down through the rocks at an angle of 52 degrees, striking the coal at 90 feet below the fault. Here it was found that the seam had flattened to 24 degrees of pitch, necessitating the blowing down of top rock for 250 feet, reaching the highest point midway at a distance of 30 feet. But the expenditure of time, labor and money was well warranted by the opening up of this magnificent seam of coal. The quality at this depth really available was 5,000,000 tons. The seam runs down 10 feet to 11 feet in height and clean from roof to pavement. The lower lift of this mine is now being rapidly developed with strict attention to its future. Everything is put to stay. The surface plant of this mine is equal to the limit of output.

The bankhead is built in the shape of a horseshoe, making a space of 320 feet from slope to tipples. The full cars from the mine are carried around the slight grade, there they are caught and guided to the tipples, of which there are both sorts, revolving and end tipples. The coal goes over shaker screens and is spread on moving picking tables, when it is thoroughly cleaned by a number of boys and men before being put in cars.

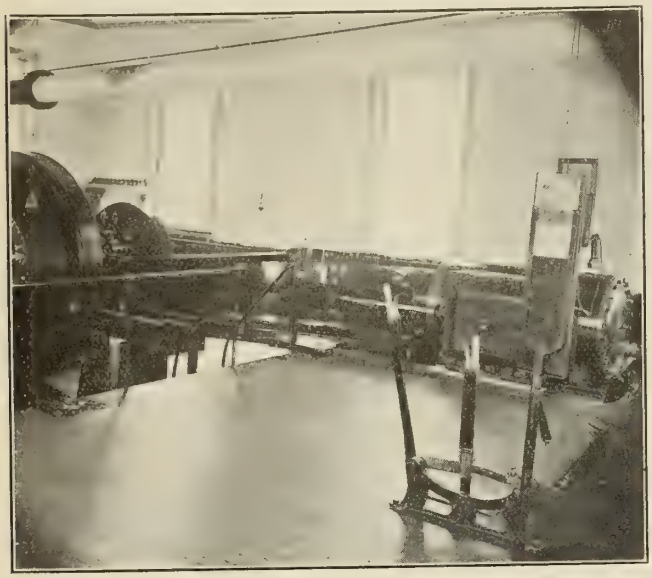
There are three such screens and tables, capable in the aggregate of handling 2,500 tons per day. The empty



No. 3 Colliery.

cars when drawn from the tipples are guided to the hoist, where they are passed to an elevator and of their own weight run by a carefully graded road to the pit brow, where the empty rake of 12 cars is made up to return to the mine. The hoisting engine is an exact duplicate of No. 3 hoisting engine, and is set well back from the bankhead buildings. This was necessary as the present is the fourth site it has occupied in making room in past years for bank extension. The engines, which are powerful looking machines, are bedded on solid concrete foundations, and appear equal to any work required. Technically described, they stand one pair 30 inch by 48 inch, direct acting, link reversing, hoisting engines, with grooved drums, 7 feet in diameter, 5 feet face each. The drums hold 6,000 feet of 1 1-2 inch steel wire rope. The fan to supply air to this mine is as at No. 3 mine, a Capell double acting blow-down with a capacity of 150,000 feet per minue, 10 inches W. G. Its size is 15 feet in diameter, 5 feet width of vane. In close proximity to this mine is the lamp station. Here 1,200 safety lamps are cleaned, oiled and tested daily by the small force of two men and a boy. Here also, steam, compressed air and electricity are brought into requisition. As a result we see the marvelous celerity with which lamps are turned out for use in the mine. The building is entirely of

brick and concrete with cement floors. The interior of the building is immaculate with paint and polish. There are but three apartments, the lamp room, repair shop and office. Within a few feet of the station is the electric power house, also a brick edifice, elaborately finished



No. 2 Engine House.

in hardwood and enameled iron works. In the interior here again paint and polish keep the building and machinery ever clean and bright. Two generators, each of a capacity of 1,200 volts, provide light for all purposes on the surface, bankheads, screens, boiler houses, engine houses, machine and blacksmith shops, all offices and places where a light is at all necessary, together with all approaches to the mines. Railway arc lights are used for the latter purpose, making the scene at night around the works a very brilliant one. Situated between the two slopes, Nos. 2 and 3, is the fire engine. It is the Northey Underwriters' pump, size 16 inches x 9 x 12 inches. It is capable of pumping 750 gallons per minute with a pressure of 100 pounds. This is, however, rendered of less consequence, now that the works system is connected with the town system of waterworks, which gives 80 pounds pressure by gravity. But nevertheless the engine is kept in beautiful order and ready for any emergency. In connection with the pump there are about the works 12 hydrants, 2 hose reels, with 2,000 feet of 2 x 2 1-2 inch hose. Some 3,500 feet of 6 inch pipe connect the various points of the works together with various smaller branches.

To move all machinery in connection with No. 2 mine (in which must be included two large and one small duplicate Jeansville pumps, one large Blake and one large Cameron pump, as auxiliary to the Blake pump) is a battery of twelve boilers, which include four Mumford, two Lancashire and six McDougall return tubular boilers, capable of generating 1,500 horse-power, all under one roof. The building is of masonry and corrugated iron and presents a very clean appearance. Four large brick stacks furnish draft for the furnaces, which are all hand-fired. The fine culm off the screens is used with best results. A telephone system is in use which connects all points of importance above and below ground with the offices and houses of all heads of departments. It takes care and strict attention to keep the system, especially the mine section, in order. But it is without question care and attention well spent.

THE BIG BEN COBALT MINES, LIMITED.

CHAPTER I.

For some time it has been the intention of THE CANADIAN MINING JOURNAL to deal with certain Cobalt and Larder Lake flotations. The difficulties in the way of doing this are obvious. At one stage and under some conditions more harm than good would result. Just now, however, circumstances have arisen which make it manifestly our duty to show the public, so far as in us lies, the difference between what they think they are buying, what they are told they are buying and what they actually are getting. We propose to take up one by one many companies operating in Canada. It will be of assistance to us if such of our subscribers as have purchased shares in mining companies will send us copies of prospectuses, and, at the same time, give us all general and specific information obtainable. Let us now to business.

(1) We have before use the prospectus of the company whose name appears at the head of this article. From this we glean the following statements: The Big Ben Cobalt Mines, Limited, was organized in Toronto on January 18th, 1907. It is incorporated under the laws of Ontario, and has an authorized capital stock of $2,500,000, divided into shares of $1 par value each; all issued as full paid and non-assessable. No personal liability.

(2) Under the caption "Financial Condition" we are told that Big Ben owns 500,000 shares of its capitalized stock, has a guaranteed working capital of $50,000, owes no debts, is not involved in any litigation and has a clear title to its property. Its property consists of about 33 acres in lot 13, concession 1, Township of Bucke, District of Nipissing.

(3) Upon farther perusal we learn that the Big Ben adjoins the Green-Meehan Mine on the east, corners with the Red Rock Mine to the southeast, the Latchford on the northeast, the McConnell on the south, and the Von Hagen on the north.

(4) Next we notice under "Engineers' Reports" that Lucky Scott, of Pioche, Nevada, described as "the well-known mine owner, operator and engineer," has recommended the property very highly. Mr. Scott enclosed in his report an assay certificate from Thos. Heys & Son, certifying that certain samples, which Mr. Scott says were taken by himself on the property, contained of silver 4,127 ounces, 15 dwts, 16 grains per ton, a value of $2,889.42 per ton. Again, R. M. Holden, M.E., "the well-known mining engineer of Cobalt, Ont., who first reported favorably upon the Green-Meehan," is quoted as saying of certain Green-Meehan and Red Rock veins, "*They must enter this lot,* and besides these veins which I have described, I can see no reason why other rich veins will not be found in other portions of *this favorably situated lot.*"

(5) The management of the company is vested in a board of nine directors, who are all active business men,

and who will safeguard in every way possible the interests of all stockholders. Active development is promised, and the Union Trust Company, Limited, of Toronto, Ontario, is specified as registrar and transfer agent.

The officers and directors are the following gentlemen:—

OFFICERS.

President—C. E. Slater, Esq., Montreal.
Vice-President—W. F. Dineen, Esq., Toronto.
Secretary-Treasurer—J. A. Goodearle, Esq., Hamilton.

DIRECTORS.

C. E. Slater, Montreal.
W. F. Dineen, Esq., Toronto.
H. C. Barker, Esq., Toronto.
D. McCall, Esq., Toronto.
J. A. Phin, Esq., Toronto.
F. B. Allan, Esq., Toronto.
P. McCool, Esq., North Bay, Ont.
F. D. Mackay, Esq., Toronto.
J. A. Goodearle, Esq., Hamilton.

Let us now consider the statements, claims and promises of Big Ben Cobalt Mines, Limited, *seriatim*:—

(1) *Capitalization.*—Big Ben owns about 33 acres of ground, upon which not one vein of high grade ore has been cut. The capitalization of the company is $2,500,000. It is therefore not unfair to characterize this as excessive, as unbusinesslike and as foolish.

(2) *Financial Condition.*—Of the 2,500,000 shares, Big Ben owns 500,000 shares, which it holds as treasury stock, and which are, at time of writing, untouched. Therefore the revenue from the shares that have been sold, apart from paying for the property, has not gone into the coffers of the company, except to the extent of $50,000. Even this is not necessarily paid in. The prospectus designates it "guaranteed working capital. We have no means of ascertaining the nature of the guarantee given, nor how much of the money has been expended in construction and development. On the other hand, it would seem to us that $50,000 out of $2,000,000 of capital placed, is an absurdly inadequate sum to appropriate for the development of a mine which is expected to give returns on such a large capitalization. We must emphasize here that the stock which has been sold is not treasury stock (the proceeds of which would naturally go to development); but the holdings of some private individuals, assigned them for reasons not specified in the prospectus. Also we must draw attention to the slender chances which the treasury stock will have when thrown upon a market that has already digested 2,000,000 shares of private holdings.

(3) Under this section are gathered the principal claims upon which Big Ben bases its capitalization, and its appeal to the public. It adjoins the Green-Meehan, it "corners with" Red Rock and in various ways it compromises itself with sundry other properties. These are all interesting facts; but hardly relevant or scarcely significant enough to warrant a $2,500,000 capitalization. Proximity to, even contact with, valuable properties is a decidedly dubious asset, especially in Northern Ontario.

(4) Fourthly we come upon "Engineers' Reports." Mr. A. W. Scott, called by his familiars "Lucky" Scott, of Pioche, Nevada, is quoted to the extent of six lines. And in those six lines Mr. Scott makes statements that have, at best, a merely speculative value and are clothed in language not commonly used in the reports of responsible mining engineers. We know nothing of Mr. Scott, professionally or otherwise. But we observe with pain that he lays himself open to grave misrepresentation. To his "report" he appends a signed assay certificate from Thos. Heys & Sons. To the best of our knowledge this certificate so placed is entirely misleading. Mr. Scott may have acted in all honesty. But the fact remains that not one high grade vein has yet been discovered on Big Ben. Therefore, until we receive further light, we must conclude that Mr. Scott was entirely ignorant (and in this he is not remarkable!) of the art of sampling. The assay returns, of course, indicate ore from a very rich vein. Thus either the sampler was ignorant or the sample was picked. The chemist has no responsibility in this. He merely analyzes and reports upon the sample given him.

A short digression may be permitted here. We have before referred to the misuse and abuse of assay returns. Let us reiterate. Such returns should be absolutely disregarded unless the whole history of the sample is given. The name of the sampler, his methods of sampling, the exact spots sampled, the conditions of shipments, all these should be specified. Neglect of these precautions at once vitiates the certificate. Usually the chemist or assayer is quite powerless to prevent the ignorant or fradulent misuse of his certificate. It is at this point that legislation is needed, and needed badly. We have had many instances of direct misrepresentation brought to our notice. Usually, however, the misrepresentation is skillfully indirect. Occasionally it is due to sheer ignorance. But in most cases it can be attributed to the clear intention of getting into the pockets of the gullible. In this respect Big Ben is by no means as bad an offender as are some other companies, whose standing it will be our duty to examine in forthcoming issues.

(5) Both the prospectus and a florid pamphlet accompanying it, dilate upon the character of the directorate. "The management," we read, "is vested in a board of nine directors." All of these are active business men "who will safeguard in every way possible the interests of the stockholders." How will these cheerful asseverations stand analysis?

Of the directors, whose names we have given above, not one is a mining man. In all charity we must allow this statement to stand unqualified.

Not for a moment would we question the integrity of any of these gentlemen. But of their knowledge of legitimate mining we are forced to entertain grave doubts. Would one of these directors lend his name to a manufacturing concern whose capital stock had been handled like Big Ben? Whose chances of making returns were as uncertain as Big Ben's? We think it hardly probable!

Also in what manner have these directors safeguarded the interests of possible shareholders? One need but glance over the previous comments to find that shareholders have little or no chance whatever to reap any financial benefit from their investment.

We are weary of reading the names of respectable merchants, lawyers, manufacturers, politicians, ministers of the Gospel and even (and this is the ultimate of indiscretion!) otherwise reputable mining engineers on promoters' literature. In any or all of these classes the willingness to become guinea pigs is indicative of gross ignorance, or of unjustified cupidity. And, conversely, it is surely time that the public realized that pre-eminent respectability of a board of directors does not constitute a mine.

In the particular case of Big Ben we believe that the members of the directorate are all honorable and responsible men of affairs. It follows then that they are identified with this promotion through ignorance of what such flotations imply. After they have thoughtfully perused this article they will no longer wish to be classed as ignorant. Therefore we may without hesitation predict that Big Ben will either go out of business or else its stock will be thoroughly dehydrated, its capitalization reduced to a sane figure, and a full account of all shares allocated and all moneys expended, given to all its shareholders.

Before concluding this chapter it is necessary to advert for a moment to the pamphlet (referred to above), which accompanies the prospectus.

To encourage the hesitating purchaser a few instances of successful Cobalt mines are given. "Temiskaming and Hudson Bay, "the pamphlet asserts, "was first offered at 40 cents per share—has paid its stockholders $92 per share in dividends and is now selling at $190."

This is perfectly true. But no more damning evidence of Big Ben's unworthiness could be adduced. The Temiskaming & Hudsoy Bay is capitalized at $25,000, of which only $8,110 is placed. Further comment would be superfluous. This and the other features emphasized, including the respectability of the directorate and the optimism of Mr. Scott are surely as undignified as they are irrelevant. A good mine need never advertise its merits.

CHAPTER II.

Another feature of company promotion and flotation to which we would like to call the attention of the public and the Provincial authorities, is the non-compliance with or evasion of the provisions of the Companies' Act.

According to the Companies' Act of Ontario, every company incorporated in this Province which has a number of shareholders greater by ten than the number of applicants for incorporation; or any company incorporated elsewhere, which has more than ten shareholders in Ontario, is required to file a copy of every prospectus issued. "No prospectus shall be used until so filed, and every prospectus shall state on the face of it that it has been so filed."

The Act further provides that "Every prospectus issued by or on behalf of a company or in relation to any intended company or by or on behalf of any person who is or has been engaged or interested in the formation or promotion of the company shall state:—

(A) The names, descriptions and addresses of the original incorporators, and the number of shares subscribed by them respectively;

(B) The number of shares, if any, fixed as the qualification of a director, and any provision in the by-laws of the company as to the remuneration of the directors;

(C) The names, descriptions and addresses of the directors or proposed directors;

(D) The minimum subscription on which the directors may proceed to allotment and the amount payable on application and allotment of each share;

(E) The time or times at which, under the by-laws of the company a further call or calls may be made upon shares subscribed for;

(F) The number and amount of shares issued or agreed to be issued, as fully or partially paid up, otherwise than in cash and in the latter case, the extent to which they are so paid and the number and amount of bonds, debentures or other securities issued or to be issued and allotted to any person;

(G) The names and addresses of the vendors of any property purchased or acquired by the company, or proposed to be purchased or acquired, which is to be paid for wholly or partly out of the proceeds of the issue offered for subscription by the prospectus or the purchase or acquisition of which has not been completed at the date of publication of the prospectus, and the amount payable in cash, shares, bonds, debentures or other securities to the vendor, and where there is more than one separate vendor, or the company is a sub-purchaser, the amount so payable to each vendor;

(H) The amount (if any) paid or payable as purchase money in cash, shares, or debentures for any such property as aforesaid, specifying the amount payable for good-will;

(I) The amount (if any) paid or payable as commission for subscribing or agreeing to subscribe or procuring or agreeing to procure subscriptions for any shares in the company or for underwriting or procuring underwriting of any securities issued or to be issued by the company or the rate of any such commission;

(J) The amount or estimated amount of preliminary expenses;

(K) The amount paid or intended to be paid in cash, shares, or debentures to any promoter and the consideration for any such payment;

(L) The dates of and parties to every material contract and a reasonable time and place at which any material contract or a copy thereof may be inspected; providing that the requirement shall not apply to a contract entered into in the ordinary course of business carried on or intended to be carried on by the company, or to any contract entered into more than three years before the date of publication of the prospectus;

(M) The names and addresses of the auditors (if any) of the company;

(N) The full particulars of the nature and extent of the interest (if any) of every director in the promotion of or in the property proposed to be acquired by the company, with a statement of all sums paid or agreed to be paid to him in cash or shared by any person, either to qualify him as a director or otherwise, for services rendered by him in connection with the formation of the company.

The Act further states that every provisional director, director or other person responsible for the issue and publication of such prospectus shall for every violation of the provisions above quoted be liable on summary conviction to a penalty not exceeding $200 and costs.

The Act further states that "Where, after the passing of this Act a prospectus or notice invites persons to subscribe for shares or debenture stock or security of a company, every person who is a director of the company at the time of the issue of the prospectus or notice, and every person who having authorized such naming of him is named in the prospectus or notice as the director of the company or as having agreed to become a director of the company, either immediately or after an interval of time, and every promoter of the company and every person who has authorized the issue of the prospectus or notice, shall be liable to pay compensation to all persons who shall subscribe for any shares, debentures or debenture stock or other security on the faith of such prospectus or notice for the loss or damage they may have

sustained by reason of any untrue statement in the prospectus or notice or any report or memorandum appearing on the face thereof or by reference incorporated therein or issued therewith, unless it is proved that having consented to become a director of the company he withdrew his consent before the issue of the prospectus or notice or that the prospectus or notice was issued without his authority or consent, and that on becoming aware of its issue he forthwith gave reasonable public notice that it was so issued without his knowledge or consent, and before allotment thereunder he on becoming aware of any untrue statement therein withdrew his consent thereto, and caused reasonable public notice of such withdrawal and of the reason therefor to be given.

The Act further specifies that the word "prospectus" shall mean any prospectus, notice, circular, advertisement or other invitation offering for subscription or purchase any shares, debentures or other securities of the company, or published or issued for the purpose of being used to promote or aid in the subscription or purchase of such shares, debentures or securities, and the word "company" shall mean any company incorporated or proposed to be incorporated.

Let us see how the company with which we are dealing has complied with the provisions of this Act.

Before writing, we visited the Provincial Secretary's office and asked to be shown all papers and documents filed in connection with the Big Ben Cobalt Mines, Limited, and the Sovereign Securities, Limited, which latter company is securing from the public subscriptions to the stock of the Big Ben. We find that the Big Ben Cobalt Mines, Limited, was incorporated on the 18th of January, 1907, but up to the time of our search, namely, 27th of August, 1907, no prospectus had been filed. The Sovereign Securities, Limited, was incorporated on June the 19th, 1907, with a capital of $100,000 in shares of $100 each. The provisional directors of this company are as follows: Jno. Ernest Cunningham, Elbert Ed. Knox, and Arthur Cohen. No prospectus of either Big Ben or the Sovereign Securities had been filed by the Sovereign Securities Company.

Now let us examine how the prospectus of the Big Ben, which we have before us, and on which subscriptions have been solicited and no doubt secured from the public, complies with the requirements of the Act.

Of the fourteen specific requirements only one is complied with in the prospectus issued by the Big Ben Cobalt Mines, Limited. That one, (C), requires the names, descriptions and addresses of the directors or proposed directors. It is probably the least important and is certainly the easiest with which to comply.

The Big Ben prospectus omits some very essential information. Requirement (G) is entirely ignored. Nowhere, also, can we find mention of the amount or estimated amount of preliminary expenses. The promoters' remuneration is not specified.

The amount paid or payable as purchase money in cash, shares or debentures for the property, and the amount payable for good-will, are of very vital importance in the organization of such a company. The organizers are expressly commanded by the Act to include this information in the prospectus. Yet Big Ben's prospectus says not one word on these points. But there is no need of multiplying words. The Companies' Act, especially in its references to mining companies, was framed as a restrictive measure. *Per se* it is an excellent piece of legislation. Unenforced it is as meaningless as a collection of Limericks. Its strict and prompt enforcement will save the Province trouble and Cobalt many smirches upon her good name.

ANKYLOSTOMIASIS

"Miner's Anemia."

By F. W. Gray.

(Continued from September 1.)

Great Britain.

Since 1893 repeated cases of anemia have occurred among the miners at the Dolcoath tin mine, Cornwall, increasing in number from one case in 1893 to twenty-nine cases in 1897. The Dolcoath mine is the most important in Cornwall. The workings are very extensive, the lowest level being at a depth of 470 fathoms. The illness among the miners was at first attributed to bad ventilation, as were the cases at Anzin in France before referred to, but after an investigation in 1902 Dr. Haldane came to the conclusion that the mine was infected with ankylostome ova. Acting on this conclusion, he treated his first patient with thymol and relieved him of 260 ankylostomes. Many of the sick men suffered from itching of various parts of the skin "with urticaria-like, or pustular eruptions, called by the miners 'bunches.'" The principal focus of the infection was the engine shaft. This shaft was used as an upcast, and in consequence was very moist and warm, the temperature being about 79 degrees Fahr. The manager, Mr. Thomas, was led to associate the prevalence of "bunches" with the pollution of the mine by excrement, and he took steps to remedy this by providing privies on the surface, and warning his men against pollution of the workings. He also improved the ventilation of the engine shaft and considerably lowered the temperature. Since that time the number of cases of anemia has greatly decreased, and at the time of Dr. Haldane's visit the epidemic was considerably abated.

The migratory habits of the Cornish miner are well known, and there is little doubt that the disease was introduced by men who had lived in tropical countries, and it is very probable the disease was introduced from South Africa or some part of South America. Steps have been taken to educate the English miner on the dangers arising from the promiscuous defecation under-

ground, and free lectures have been given throughout the mining districts, illustrated by lantern slides showing the worm at different stages of development.

In many collieries steps have been taken to provide underground closet accommodation, and to improve the surface arrangements in this respect. A joint meeting of representatives of the coal owners and the miners' unions was called by the Home Office authorities to consider whether any compulsory sanitary regulations were necessary, and it was concluded that a present no measures of this character were needed, but it is not unlikely that compulsory regulations with reference to the provision of underground closet accommodation may be enforced in mines having a temperature of more than 70 degrees Fahr.

Conclusions.

From the foregoing notes it will be seen that ankylostomiasis is a dirt disease, and has its genesis in uncleanly and unsanitary conditions. Br. Bruns, a German bacteriologist who took a prominent part in the Westphalian anti-worm campaign, is very insistent in his writings on this subject on what he calls the "disposition" of a mine to receive infection. By "disposition" he designates a combination of natural conditions favorable to the reception and dissemination of infection. Many mines possess this receptivity to such a marked extent as to be practically artificial culture grounds, in every way adapted to the propagation of the parasite. The points of infection are multiplied indefinitely, and the resultant disease among those who work amidst such conditions will attain a virulence and to proportions that are probably impossible under natural outdoor tropical conditions. In mines of this character the course to be pursued is very obvious.

So far as the writer is acquainted with Canadian coal mines, this disposition is not present in any marked degree. In the large mines of the Cape Breton coal field, for example, the two necessary concomitant conditions of heat and moisture do not exist together in the same mine. The mines are damp, as is to be expected from their comparative shallowness, but they are cool and very well ventilated. Where the coal is worked at a greater depth the workings are of course much warmer, but they are so dry as to be dusty. Another feature that may possibly be counted upon as a deterrent is the composition of the mine water. The acids contained in the majority of the Cape Breton mine waters will no doubt act adversely on the recently hatched and unencysted larvae. As the mines advance under the bed of the ocean, these conditions may of course alter. It may be noted, however, that in similar circumstances the saline character of the percolated water has been found to kill the young unencysted larvae. Again, the system of coal extraction practised in Cape Breton, the thickness of the seams, combined with their low angle of dip, are features less favorable to the spread of the infection than the corresponding conditions in European coal mines. In working bord and pillar there are probably more holes and corners where deposited excreta may rest in undisturbed innocuousness than is the case in the highly inclined seams of middle Europe, where the clothes and the hands of the workmen become contaminated in climbing ladders and in descending chutes. In longwall work the goaf is obviously a convenient and harmless place for purposes of defecation. On the whole, therefore, natural conditions as they at present exist in Cape Breton would appear to ensure a comparative immunity from the incursions of the parasite. But, on the other hand, medical authorities have not yet fully determined what constitutes "disposition," and within what limits of temperature it is possible to promise complete immunity. There may be detached places in an otherwise immune mine where the conditions would favor the reception of infection. Further, and most important, considered in the light of European experiences, there is a very large foreign element in the Nova Scotian coal mines, recruited in many instances from portions of the Old World where the disease is known to be widespread. Many of these men are undoubtedly "worm-carriers," a state not incompatible with apparent robustness, and only to be ascertained by microscopical examination of the dejecta. As one German medical man pertinently remarks: "A single worm-carrier working in a mine possessing the disposition to infection is sufficient to infect the whole of that mine." That it is the contaminated condition of the underground workings that give rise to ankylostomiasis as a miner's disease is evidenced by the fact that in only two recorded cases has ankylostome infection been discovered among the wives and families of the miners in the European coal fields. In the two cases mentioned the infection was caught through contact with contaminated matter. One case was that of a boy whose duty it was to clean his father's pit boots, and the other was also a boy, who had been in the habit of eating the remains of his father's pit lunch.

While, therefore, there does not seem to be the remotest possibility of any need for such drastic and expensive preventive and curative measures as necessity has demanded in the mining centres of Europe, yet a plea for at least descent sanitary conditions is quite justifiable. The individual colliery manager is the best judge of whether his mine possesses any "disposition" to infection, and he can act accordingly. Especially can he endeavor to prevent the promiscuous deposition of faecal matter in hot, moist situations in the mine, or in places where it is likely to be disturbed and carried along by the traffic of the mine. Adequate and proper latrine accommodation on the surface is also a matter that is worthy of attention, nor would anything be lost by the provision of some place in a large pit bottom where faecal matter could be properly isolated and disinfected. Sanitation is as necessary at a colliery as at any other works where large numbers of men are employed, and some little attention to this matter would improve the morale of any colliery. In this connection it is to be feared that the closet accommodation of many colliery villages is primitive and unsanitary.

One of the leading coal corporations of Canada, which recently imported a number of Belgian miners, took the precaution of engaging only such men as were able to produce their "worm-free" certificate, showing that they were, in the opinion of some qualified man, quite free from ankylostome infection. Recently one of these men, writing home to his friends, stated that the conditions of work were admirably suited to those who had suffered from ankylostomiasis.

In conclusion we would say that any statements of an alarmist character are most strongly to be deprecated, for, as before stated, most Canadian mines lack the "disposition" to infection that in most European mines existed in a marked way, but, despite this fortunate fact, the whole subject is worthy of attention from mining engineers and mine doctors in Canada and the States, both from a sanitary and from an economic point of view.

THE LABOR SUPPLY OF CAPE BRETON.

By Our Own Correspondent.

The inadequacy of the labor supply in the Cape Breton mines is a problem of increasing acuteness, and one might almost state that it is the only problem of any real gravity from a managerial point of view that we have down here. The natural conditions under which coal is mined in Cape Breton are remarkably favorable, but the labor question is a constant disturbing factor that must be taken into account in all calculations of output. It is not a simple question, but is complicated by a combination of local circumstances and traditions, with climatic and geographical conditions of an unusual character.

Since 1890 the production of the Cape Breton coal mines has quadrupled itself, and while such a rate of progression cannot be indefinitely prolonged, yet there will be no slackening in outputs for a long time to come. On the contrary, the yield of the Cape Breton mines must increase along with the general and inevitable expansion of the whole Dominion of Canada. The total output of coal in Canada is a little over 8,000,000 tons at the present time, but in the next ten years this tonnage will probably be produced in Cape Breton Island alone, if the men can be found to produce it. The population of Cape Breton has not increased in anything like the same ratio as the increase in its mineral exports. The native miner is as efficient a workman as can be found anywhere, but he is decreasing in numbers. Every year the children of the miner show an increasing disinclination for the calling of their father. To-day the sons of Cape Breton miners are to be found scattered over the New England States and throughout the rest of the Dominion, many of them holding lucrative and responsible positions.

In the past the sheet anchor of the mines when in want of labor has been the outports of Newfoundland, but the ancient colony has also shared in the advance and prosperity of the Dominion, and to-day Newfoundland has her own growing industries. Men are not to be picked up there to-day as they were in former years.

Then over all is the lure of the West, so tempting to the adventurous sons of a Highland race, when they hear the glowing and over-wrought tales of the Western land agent. If they heard their own Cape Breton farm described by one of these same gentlemen they might possibly wonder why they ever left it. Why should all the eloquence of the Dominion be used to set forth the advantages of the West, and to encourage the emigrant to go there? Are there no natural advantages, no beauty spots in the East to invite the settler? However, after all is said, it is the destiny of our race to "go West," and this is the day of the "last West." There seems no likelihood that this drain on the Cape Breton population will lessen for some time to come.

The fact that the major portion of the product of our mines goes up the St. Lawrence, and that the season of navigation is confined to the period between say the middle of May to the end of October, or to six months out of the twelve, necessitates a considerable difference in the rate of production during the season of open water and the winter months, and it is, therefore, unavoidable that a certain portion of the mining population should be of a more or less migratory character. This circumstance limits the number of resident miners and permanent settlers in the colliery towns. This difficulty has in recent years been very largely minimized, and it will never agin be so acute as it has been in years gone by, although it can never be entirely removed.

These are some of the circumstances that have operated to bring about the present stringency, but there are other conditions that make it difficult to relieve the situation, and some of these we may enumerate.

In many respects the price of living in the industrial centres of Cape Breton is unnecessarily and inexcusably high. This is particularly true as regards garden produce and meats. Why it should be necessary to bring market garden produce all the way from Truro and further, and dressed meats from Ontario, is not quite clear. There is a population of something like 30,000 people in the Sydney and Glace Bay district, nearly all of them earning big wages, and there is not a market garden worthy of the name in all the county. Neither is there any proper means of exchanging the dairy, garden and other produce of the farmers from the country with the industrial population. Under present conditions the farmer must barter his goods to the storekeeper, who retails them to his customers, the result being two profits to the merchant, inadequate remuneration to the farmer, and increased prices to the consumer. A weekly market would remedy this state of affairs, and would bring the agricultural interests of the county into closer touch with the workers, to their mutual advantage. However, as the Town Councils in most of the towns in question are composed of tradesmen, it is not to be expected any move of this kind will emanate from them or have their support. The same conditions adversely affect fishermen, and the price of fish, which in a place like Glace Bay should be cheap, but is not. It is no wonder that newcomers to the mining districts become scared when they are asked 25 cents for a cauliflower, 10 cents for a cabbage, and a cent each for very small carrots!

The people of this Island do not receive the stranger with open arms, and there still survives here some of the spirit that regards everybody coming from beyond Canso as a "foreigner," and this is apt to frighten away the emigrant, more especially if he excites hostility by explaining how they do things "at home." The people of this Island must be known before they are understood by the stranger, and if he remains here he will learn that they can appreciate a "proper man" and that nowhere else in the Dominion are there better chances for the man who is not lazy than in Cape Breton.

Another and more serious setback to immigration here is the lying reports that are purposely set afoot by disgruntled individuals as to conditions here, and industriously circulated in the newspapers of foreign countries and also in England. Public men in our Empire betray an ignorance about this country that is surprising, to say the least. In this connection we may refer to the recent warning that emanated from Mr. Keir Hardie, M.P., the Socialist leader of the Independent Labor Party in England, cautioning men against going to Nova Scotian mines. It is said that Mr. Hardie may speak at Glace Bay at the coming labor convention, and at the risk of being tedious, we think it may be interesting to quote his letter, published in the *Yorkshire Post* lately, and a rejoinder that appeared in the *Canadian Gazette*. Mr. Hardie appears to have confused Sydney, N.S.W., with Sydney, N.S. British members of Parliament have been

known to make similar geographical blunders before when dealing with the King's Dominions over the seas, and this letter of Mr. Hardie's is a fair instance of how flimsy is the basis on which some reports gain credence. We are very glad to notice that the Agent-General for Nova Scotia took such prompt action to counteract the effect of Mr. Hardie's warning, but we may point out that the *Yorkshire Post* is one of the most influential papers in the British Provinces and has the reputation of being particularly well-informed on Canadian matters. Mr. Hardie's warning had a very extended circulation.

MINERS AND EMIGRATION.

To the Editor of the *Yorkshire Post*:—

Sir,—In every mining district of England, Scotland and Wales just now bills are out inviting miners to go to certain unspecified mines in Nova Scotia and elsewhere, where high wages are to be had, and where the cost of living is no more than it is here at home. The trick has been so often played in the past that I would beg miners to be on their guard and to make inquiries before being tempted to go abroad without knowing what is in store for them.

As showing the need for caution, I ask you to be good enough to insert the enclosed letter which I have received, and which explains itself:—

New South Wales, Australia,
Woonona, April 23, '07.

Mr. Kier Hardie, M.P.,
Leader Parliamentary Labor Party,
England.

Dear Sir:—

I have been directed to write to you as being more closely in touch with the working classes of Great Britain, and especially that class which the paid envoys of the Australian capitalists are endeavoring to induce by false statements to emigrate to this country. There has recently arrived in this State of New South Wales a number of Scotch and Welsh coal miners who were misled by the glowing reports of the constant work and the high wages to be secured, but who now find that they can scarcely make a living wage, and are practically stranded in a strange land. I desire to state that there are more men here now than can get work at decent wages. The object of the employers in flooding the country with surplus labor is apparent to all of us, and I trust that now the question has been brought directly under the notice of your party that they will take such steps as will prevent in future numbers of their countrymen being misled and fleeced of what little capital they may be possessed of. I enclose a cutting of a paper published in the *Illawarra Mercury*, also the last issue of the *Sydney Worker*. In it you will see how some of the South Africans have fared after coming here. This must be the fate of those who arrive here for some time, until those at present here get work. As to the agricultural laborers required here, there are hundreds here prepared to work at it for almost their bare tucker until something else turns up, and you can judge of the great surplus of land when there has been as high as 800 applicants for three small blocks, and good men have been waiting for years to secure a block under the present system of balloting. I will be pleased to supply you with any information concerning labor conditions in existence here at any time, and trust that you will give every publicity to the statements contained herein.

Yours faithfully,
(Sgd.) THOMAS R. MORGAN,
General Secretary Industrial Employees' Union.

Trusting this warning may not be in vain,
Yours, etc.,
J. KEIR HARDIE.

The House of Commons, July 3.

Mr. Kier Hardie, by the way, signalizes his departure for Canada by issuing to the British press a warning against a notice circulated in the mining districts of England, Scotland and Wales inviting miners to go to certain unspecified mines in Nova Scotia, where wages are high and the cost of living no more than in this country. Mr. Keir Hardie sees some trickery in all this, and warns British miners to be on their guard. We have not seen the notices to which Mr. Keir Hardie refers, but the reference is, we imagine, to the intimation which the Dominion Coal Company, of Glace Bay, Nova Scotia, gave out in the spring that they would require a large number of men for work in their mines during the six months beginning with the end of March last. This intimation, we imagine, still stands good, and that Mr. Keir Hardie and his friends may see that there is no trickery about it, we reproduce the details of the offer as supplied by the company to Mr. John Howard, the Agent-General for Nova Scotia, at the end of March last. They say:—

During the coming six months we will require a large number of men for working our mines. This class of men we want will require to have had experience in coal mines. We require shooters and loaders—that is, men who can shoot and load coal after the mining machines. They will require to have shot-firers' certificates or be in a position to pass the necessary examination before the examining board at the colliery where they will be employed. We also require loaders and drivers. This is unskilled labor, and they do not require certificates, but it would be advisable to have men who have had experience in coal mines. At this season of the year there are large numbers of mine workers leaving England for Canada, and we believe that a considerable number of those men would prefer work in the mines rather than go farming, provided they were sure of getting steady employment on their arrival here. Our mine workers are all paid on a tonnage basis, and make good wages. Shooters and loaders make from $2 to $3 per day, and loaders and drivers from $1.50 to $2 per day. Board and lodging costs from $3 to $4 per week.

It is pleasing to note that the Premier of Nova Scotia has recently announced his intention of establishing a Department of Immigration for Nova Scotia. There is plenty of work for such a department, if only in the distribution of accurate facts about this neglected Province, and the prompt contradiction of such injurious statements as that of Mr. Hardie's. Recently the writer was on the "Empress" boat at Quebec that brought 2,000 odd passengers to this country. Out of the whole of that ship's company there were not a dozen people bound east of Montreal. All the rest were "going West." The ordinary emigrant to Canada, who has studied the literature that is distributed over on the other side, knows about as much of Nova Scotia as he does of Nova Zembla. The need of a Nova Scotian Department of Immigration is pressing.

Some of the assisted emigration to Nova Scotia has not been judiciously arranged, and in the last winter the

big industries at the Sydney terminus of the Intercolonial Railway were used as a dumping ground for indigent emigrants who were brought over in large numbers in the early spring to work on railway construction in the West. Owing largely to the severity of the season these works were not ready, and there were hundreds of men out of work in Halifax in February and March of all months. The Salvation Army were to blame for a great deal of hardship. To instance one case—a man, whose only qualification for employment at the mines was that he was a general laborer, arrived in Sydney on the 7th of March with his wife and six children, the oldest of whom, as we remember, was not more than eleven years old. The 7th of March will long be remembered as the date of one of the worst blizzards on record here. Imagine the case of this man, who had to find employment, housing and food for six children and his wife. He could hardly be blamed had he said hard things about Cape Breton. It is pleasing to know that he and his family were looked after, that employment was given him, and that he is now doing well. But this is not quite the way to arrange emigration, and somebody blundered and kept on blundering during the early part of 1907. On the same train was a young man with his wife and three children, and a mixed party of men seeking employment having such varied trades as clerk, green-grocer, gamekeeper, etc., not one of them having ever seen a coal mine. There was also the case of twenty men who were stranded at Port Hawkesbury for days, who were sent by the same organization. Their plight was related in every paper in Canada and in England, the blame being put on the coal companies. Before this mischievous paragraph had finished its newspaper career it was garbled and twisted beyond recognition, but the writer is in a position to say that it very materially and adversely affected emigration to Cape Breton. We fear that unless the Salvation Army mend their ways they will miss in Canada the most magnificent opportunity that ever offered itself to a religious organization. Every summer Cape Breton becomes the happy hunting ground of the Montreal labor agent, and employment sharks of every description with Semitic names. These gentlemen are kindly assisted now and then by our railways, who run cheap excursions to the West. One that recently left Sydney took away 300 men. The *Eastern Chronicle,* commenting on this, says: "The cars were loaded with young men, every one of whom is wanted at home; there is plenty of work for each to do at home, for which he would earn more money than he will in the West. This principle, by a system of extensive advertising and cheap railway transportation, of denuding the East of young men for the sake of the West, is a national scandal." The *Eastern Chronicle* might have added that no one ever heard of cheap rates to the coal fields and the steel industries of Cape Breton on these same railways. And yet we venture to think that the coal and steel of Cape Breton are national assets as valuable and as necessary to our national welfare and advancement as the wheat fields of the West. We do not wish to disparage the West. It is not in the power of any man to disparage so great a country as the West of Canada, but when our industries in the far East languish for want of laborers, are we not entitled to equal facilities and similar consideration?

What one might term the human element plays no small part in the matter of a labor supply. Men who come out to a new country may do well financially and have every advantage, but sooner or later there comes the inevitable homesickness, the "Heimweh," that is not to be denied. This feeling is intensified by the isolated and monotonous life the newcomer must live. Many of the men who arrive here, particularly men from the Old Country, have been members of some church or other, and have found a great deal of their social life in chapel teas, meetings, etc. This is particularly true of the Nonconformist, and the dissenter predominates among the miners in the United Kingdom. We suggest that if the clergy were at more pains to follow up the newcomers their church membership would benefit, and more men would become permanent settlers.

We have before referred in these columns to the insane liquor laws of this Province, and to the lack of technical education or intelligent amusement for the workingman, and need not dwell on these matters now. All the same, they are matters of the greatest importance in having and holding industrial population.

While the miner and the miner's son find underground employment natural and not irksome, the man who has never descended a coal mine is apt to balk when asked to do so, even with the temptation of big wages. In actual fact, work in a modern well-ventilated mine is less trying than work on the surface, where men are exposed to the vagaries of the weather. However, the ordinary man, not being a miner, prefers to work above ground. Some nationalities take more kindly to pitwork than others. Italians, particularly the northern Italians, make good miners after a while, but permanent workmen are best obtained in other mining centres. Generally speaking, the problem is very different to the ordinary labor question, and the class of men required are limited in numbers.

The following is a presentation of the major factors in the labor problem, some of which it is difficult to express. The remedy for some of the difficulties enumerated is fairly obvious, and we take it that a general solution would involve many small adjustments of existing conditions, which, though insignificant in themselves, would total up to a good deal. In other words, the situation must evolve its own remedy, but it can be assisted in many ways. There are many matters with which we have not dealt, such as the attitude of the P.W.A., the nationalities best suited to Cape Breton industries, wages and housing, systems of coal working, etc., which must be left to a later issue.

The fire-damp detector of M. Hardy, a Frenchman, is an ingenious application of the microphone. Two pipes of equal pitch—one in the mine and the other above ground — are sounded simultaneously, and the sound waves impinge on microphones connected in series with a telephone. If both pipes are in pure air a clear note is heard in the telephone. If the pipes are in air of different density, beats are heard, and these give warning of the presence of fire-damp in the mine.

The following are the British newspapers whose representatives are invited to inspect the mineral resources of the Province of Ontario: Times, Telegraph, Morning Post, Standard, Tribune, Daily Mail, Financial News, Financial Times, Yorkshire Post, Birmingham Post, Liverpool Post, Manchester Guardian, Economist, Statist, Globe, Pall Mall, Financier.

MICHIPICOTEN ISLAND.

A. B. Willmott.

It may be of interest to your many readers to have a little information concerning Michipicoten Island and the recent silver find reported there. Mr. Gordon Michael and partner have been prospecting on the island since early in the season, and recently came to Sault Ste. Marie to record their claims. He exhibited a specimen of native silver over a quarter of an inch in thickness which he had taken from a vein on one of his properties. Other specimens showed considerable native silver in a calcite gangue, and still others native copper. The silver vein is not wide, varying from one to three inches, and runs about at right angles to the direction of the copper bed. The matrix of the copper is not a vein, but a bed, following the strike of the formation, and from one to three feet in width. An analysis of an average sample of this bed is said to have yielded 2.6 per cent. in native copper. The news of the discovery spread through the Soo, and numerous prospectors have started for the island. It is reached by means of the steamers of the Dominion Transportation Company, sailing from here twice weekly. The island embraces in the vicinity of 45,000 to 50,000 acres, of which a considerable part is not even surveyed. The Jones location of 6,400 acres on the west end, and the Bonner location of the same size across the centre are the two main holdings on the island. Eight more properties of small acreage have been patented, and three mining claims recorded, so that not more than 15,000 acres of the island have yet been alienated from the Crown. Quite an additional acreage was at one time applied for, but applications have lapsed.

Geology.

Geologically the island is very similar to the formation on the south shore of Lake Superior as exposed at Keweena Point. As shown on Irving's map, in his work on the "Copper-bearing Rocks of Lake Superior," it is the lower part of the Keweenaw formation which occurs at both places. He writes, page 347: "The facts given above . . . establish then a complete identity between the Michipicoten Island rocks and those of the typical cupriferous districts of the south shore of Lake Superior."

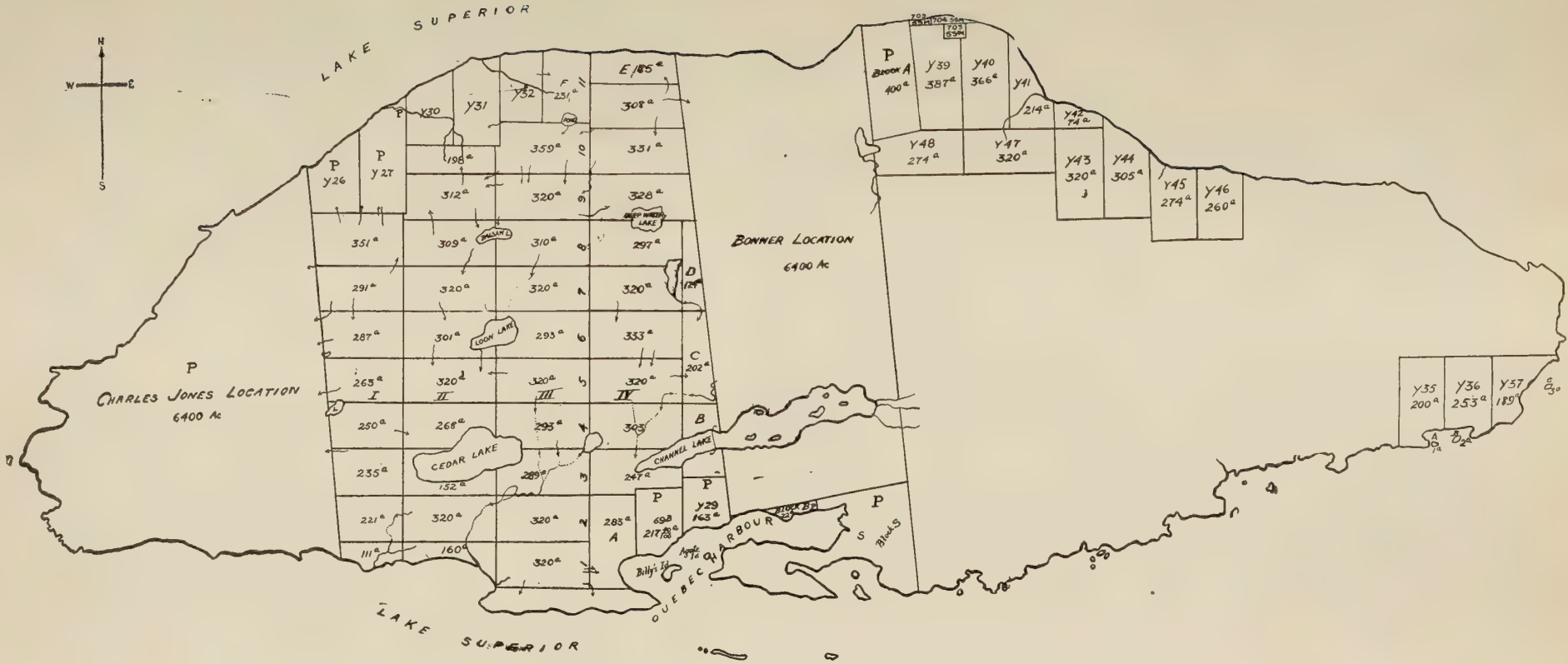
The Canadian Survey has made almost no survey since 1865, when it was reported on by McFarlane in the report of 1863-66. The following paragraphs are published in the 1863 report:—

"Towards the west end of the island, the rocks present a low surface for a breadth of four or five hundred feet, and then rise into a cliff two or three hundred feet in height, in which the greenstone is marked by druses containing analcite and quartz. A soft amygdaloidal bed holding native copper is traceable for some miles along the shore, sometimes beneath the surface of the water in the bays, and again running a little distance inland. In this bed in the north bay an attempt was made, a few years since, to work a remarkable deposit of native copper and silver, which were found disseminated in grains through a green hydrous silicate of nickel. The ore being stamped, the nickel, whose value was not suspected, was washed away from the residue of native metals, which gave in one trial twelve parts of silver and eighty-eight of copper. A shaft was sunk here to a depth of 70 feet; but after a considerable outlay, the working was abandoned. Nothing very definite is known as to the mode of occurrence of this curious metallic deposit, which is stated, however, to have been associated with calcspar. From the same mine were said to be obtained the specimens of mingled arsenides of nickel and copper, which, with the preceding nickeliferous ore, are noticed on page 506, and again on page 737. At a point near the west end of the island, and seven miles from the workings just mentioned, the cupriferous stratum again appears, and fragments of the native metal are scattered along the shore. Mining operations on a small scale were undertaken here ten years since by the Quebec Mining Company, and a shaft was sunk at a little distance from the shore, by which the copper-bearing beds were reached at a depth of forty-five feet. The mine is now leased to Mr. Hugh R. Fletcher, who is engoged in working it, and has kindly furnished the following particulars. Beneath the principal copper-bearing bed is a soft argillaceous rock, known as an ash bed, which is six feet, and perhaps much more, in thickness, and is underlaid by a massive greenstone. The ash bed itself contains from one-half to one per cent. of disseminated metallic copper, which it is supposed can be economically extracted by crushing and washing the soft rock. Upon this reposes the principal copper deposit. The metal is found in a bed of greyish amygdaloid of from eight to eighteen inches in thickness, and an overlying bed of sandstone of from twelve to twenty-four inches; the united thickness of the two being on an average about three feet. The proportion of copper is the same in the two rocks, and averages two and a half per cent. The copper is in larger grains in the amygdaloid, and is sometimes surrounded by calcspar; while in the quartzose sandstone it is in fine particles, or in filaments. Small specimens of the sandstone are occasionally found containing ten or fifteen per cent. of copper. The bed is overlaid by a massive compact greenstone, to which succeed amygdaloid and conglomerate. The dip of the copper-bearing stratum is about three feet in a fathom. Three shafts have been sunk upon it, one to sixteen fathoms, one to twelve and a half, and a third to eight and a half fathoms. From 300 to 400 tons of two and a half per cent. ore have been raised; and in the spring of 1863 it is proposed to commence operations on a larger scale, with proper machinery. Small portions of native silver and of vitreous copper ore have been found in this vicinity; and according to Mr. Wilson native copper occurs in a second band of amygdaloid about a mile and a half south of Mr. Fletcher's mine, and 200 feet above the surface of the lake. Vitreous copper ore is also found with calcspar and sulphate of barytes on the eastern extremity of the island, in a reddish phorphyritic rock, near which occurs a pitchstone phorphyry, and pitchstone with veins of agate."

History of the Work.

The first work of any consequence was done about the years 1860-61 by Mr. H. Fletcher on behalf of New York parties with very encouraging results. Financial difficulties caused the property to be abandoned. In 1875 the Quebec & Lake Superior Mining Association made extensive explorations, and erected buildings on the Jones location. About the same time Phillips explored on the adjoining locations to the east and sunk several shafts and found good copper in all. In 1880 the Michipicoten Native Copper Company was formed, and began work on a very extravagant scale, which soon brought them into difficulties.

Later the property passed into the hands of Mr. Joseph Cozens, of Sault Ste. Marie, who interested parties con-



MICHIPICOTEN ISLAND

nected with the Standard Oil, and this location (the Jones) has passed into their control. The bulk of the work done has been on an amygdaloid bed similar in character to the lode of the Quincy Mine of the south shore of Lake Superior. The main shaft is 520 feet deep, and the Batler shaft 360. A little over a mile west of the main workings, a conglomerate bed was discovered, on which a shaft was sunk showing the pay streak two feet wide and carrying 5 per cent. copper.

The Bonner location, after lying idle for a long time, passed this summer into the control of some Sault Ste. Marie parties who interested some Chicago parties in it, and a diamond drill has been at work for some months with encouraging results.

Ore Possibilities.

All parties who have examined the island do not hesitate to compare it with the similar formation on the south shore of Lake Superior, and in consequence to expect that copper of value will be found. Indeed, the surface indications have been most promising, and had more skill and more economy been used in the development operations there is no doubt but that a successful copper mining company would long ago have been established. As to the silver possibilities, the question is a very uncertain one, as we are forced to reason almost entirely from analogy. Specimens of native silver are of frequent occurrence on some of the south shore properties, associated with the native copper, but no large amounts have yet been taken out. Similar association of the silver with the copper is found on Michipicoten Island, and whether it will be found in larger amounts than on the south shore one cannot say. Certainly rich specimens of it do occur, so rich that had they come from the vicinity of Cobalt there would be a stampede at once. It is to be noted that the diabase with which everyone admits the silver of Cobalt is connected, is probably of the same age as the enormous diabase intrusions found on Michipicoten Island. Further, it is to be noted that the arsenides of nickel are common to the two districts, though so far as discovered not yet in large amount at Michipicoten. One must, however, be guarded in inferring that because diabase eruptive of the same age occur at both places, and that the nickel minerals associated with silver are found in both places, that both places will be equally rich. The similarity is, however, excellent ground for the careful prospecting of Michipicoten Island for silver, although perhaps the probabilities are that native copper will in the long run prove the more remunerative. In searching for native copper, it is well to remember that there are two classes of ores, the one found in the conglomerate and amygdaloid beds, and the other found in the veins crossing these beds. No copper is found in the acid eruptives, nor in the massive portions of the diabase; it is the upper vesicular portions of the lava flows in which the copper is found. Epidote, chlorite and prehnite are the most frequent mineral associates of the copper. Calcite veins are usually poor in copper. Where veins are found they usually widen in passing through the soft rocks like amygdaloid and narrow off in the massive diabase; the contacts with the softer rocks are more likely to prove metal-bearing. In the conglomerates it has been found that the thinner beds near the diabase sheets are the more likely to be productive.

DR. ROBERT BELL, F.S.R.

Chief Geologist, Geological Survey of Canada.

Dr. Robert Bell, the present Chief Geologist of the Geological Survey of Canada, is a son of the late Reverend Andrew Bell, an amateur geologist of note in the early days of the Survey, and a personal friend of Mr. (afterwards Sir William) Logan. After the death of the senior Bell, his son was sent out by Logan on field geological parties under Mr. James Richardson. In 1859, when he was not more than 17 years of age, young Bell was given independent work on Manitoulin Island, on the southern shore of Georgian Bay and thence in the country southward to Lake Ontario. In 1860 he accompanied Mr. Alexander Murray, Assistant Provincial Geologist, to Lake Superior; but the following year he was given charge of a party of his own. In the autumn of 1863 he was appointed Professor of Chemistry and the Natural Sciences in Queen's University. This position he filled for five sessions and at the same time continued his field work each summer. In 1869 he resigned and the same year was employed as chief of a large party in the Thunder Bay District and in making a topographical and geological survey of Lake Nepigon. Later he was on the Government expeditions to Hudson Straits and Bay, on the Steamships Neptune, Alert and Diaga, as geologist and naturalist. On the first two expeditions he also acted very acceptably as medical officer.

Dr. Bell has now been connected with the Geological Survey for fifty years. His robust health has enabled him to accomplish a large amount of work. The scene of his labors includes practically the whole of Canada.

Dr. Bell has always been particularly interested in obtaining the collections of economic minerals and useful mineral products for the various international exhibitions. From the year 1863 until the Survey officially took up the work, he voluntarily procured and prepared statistical and other mining information. It was on his invitation that the removal of the headquarters of the Survey from Montreal to Ottawa in 1881 took place.

For five years Dr. Bell was Acting Director of the Survey, and during that period the volume of work accomplished was largely increased. Indeed, one has but to glance through any of the publications of the Survey for the past half century to get some conception of the variety and excellence of Dr. Bell's labors.

In 1903 Dr. Bell was commissioned as a delegate from the Dominion Government to proceed to Vienna in order to invite the International Geological Congress to meet in this country. Before this, in 1888, he was selected by Sir Oliver Mowatt as one of the Royal Commissioners on the Mineral Resources of Ontario, and he wrote important sections of the report of that Commission.

Dr. Bell's scientific accomplishments are not, however, confined to geology and mineralogy. He has published several brochures on Canadian forestry. He has also studied the archæology and ethnology of the native races of Canada. This pre-eminence in these emdite branches of knowledge is evident from the position he holds as President of the International Congress of Americanists, which held a highly successful meeting at Quebec last September and will hold its next meeting in Vienna in 1908.



DR. ROBERT BELL

As an explorer and geographer Dr. Bell has done most notable service to his country. The traveller in sub-Arctic regions encounters many evidences of this in the nomenclature of striking topographical features.

Last year the Council of the Royal Geographical Society recognized the value and extent of his explorations by awarding him the Patrons' Gold Medal. In January of the present year the Council of the American Geographical Society voted him the Cullum Gold Medal, and about the same time the Duke of Argyll sent him a very valuable gold medal "in admiration of his services to geology in Canada."

Dr. Bell is the possessor of a phenomenally large number of degrees. Not only is he a graduate B.Sc., a D.Sc. and a M.D.C.M., but he also can boast a long list of honorary degrees. In 1897 he was elected a Fellow of the Royal Society of London, a high distinction; but a few years ago there was conferred upon him the Companionship of the Imperial Service Order "for faithful service."

In closing this necessarily incomplete and scanty account of Dr. Bell's long career, it may be added that from him a large number of young geologists have received their first lessons in field geology.

COAL MINING IN ALBERTA IN 1906.

From the annual report of the Department of Public Works of the Province of Alberta some significant facts and figures are to be gleaned concerning the progress and present condition of coal mining in that new Province.

In the year 1901 the total output of coal for the Northwest Territories, Alberta and Saskatchewan was computed to be 346,649 tons. During the years 1902, 1903 and 1904 the output stood at 510,674 tons, 622,939 tons, and 782,931 tons, respectively. But the year 1905 saw Alberta alone raise 811,228 tons, and in 1906 the figure of 1,385,000 tons had been attained, or almost exactly four times the output of 1901, and an increase of 70.73 per cent. over the 1905 output.

The report classifies the coal raised thus:

Lignite coal	602,780 tons.
Bituminous coal	546,623 tons.
Anthracite coal	235,597 tons.
Coal used in coke production	103,936 tons.
Coke produced	69,844 tons.

On account of the large amount of lignite mined in the Province, the recent step taken by the Railway Commission in prohibiting the use of this fuel on railways, on account of its high percentage of volatile combustibles, and its liability to cause locomotives to emit sparks, will have a very serious effect upon the Province.

If the figures representing the coal used in coke production and the coke produced are correct, they imply that a yield of over 67 per cent. coke has been obtained in bee-hive ovens from Alberta bituminous coals. This speaks well for the coals and for the management of the ovens.

Accidents.

In proportion to the coal raised, the percentage of accidents was slightly higher than in the United States. For each 138,500 tons, one person was killed, 1.1 persons seriously injured, and 2 persons slightly injured. Nova Scotia, in this respect, holds the world's record—250,000 tons of coal for each fatal accident; Great Britain comes next with 210,800 tons, then France with 200,000 tons, the United States with 165,000 tons, and Germany 154,773 tons.

In the past year, then, in the coal mines of Alberta there were 10 fatal accidents, 11 persons were seriously injured, and 20 slightly injured, making a total of 41 accidents. Of the fatalities, five resulted from falls of coal, rock or clay.

In commenting upon those casualties, it must be remembered that most of Alberta's coal mines are in the first stages of development. The average number of employees for each mine is much smaller than in older countries, and operations are spread over a very large area. Hence rigid inspection is difficult, and many precautions valuable in more developed mines are either inoperative or positively harmful at present. Under these conditions, the list of accidents is not excessive. It by no means follows that improvement is not possible. The Albertan Government has proved itself alive to the requirements of its thriving coal industry, and, we doubt not, each year will reduce the percentage of fatalities and accidents.

Coal Mines Opened and in Operation.

There are 61 coal mines in operation in the Province in 1906. Sixteen of these were opened during the year. Two mines also were abandoned during 1906, one at Edmonton and one at Frank. Among the principal producers are the following:

The Pacific Coal Co., Bankead, has an output of 1,200 tons per day. An electric plant operated at the mine supplies the towns of Bankhead and Banff with light. The main tunnel has a length of over 3,000 feet from the mine mouth. The system of working is breast and pillar. A one-unit briquetting plant, built under the patent of the Zwoyer Fuel Company, N.Y., was installed during the year. It has a capacity of 200 tons per day. One marked feature of this camp is the fact that the company runs a large and well equipped skating and curling rink for its employees.

At the International Coal and Coke Company's mines at Coleman, ninety new return ovens were installed, together with a Bradford coal braker and slate picker to crush and clean the coal from No. 4 seam.

The Canadian-American Coal and Coke Company have installed a modern tipple plant, capacity 1,000 tons per day, placed about a quarter of a mile from the mine mouth. The coal is hauled that distance by means of a main and tail rope haulage.

The Hillcrest Coal and Coke Company, Hillcrest, operate three seams, having thicknesses of 14 feet, 12 feet and 8 feet, respectively. The system of working is pillar and room.

Two mines are operated by the West Canadian Collieries, of Blairmore—the Bellevue and the Lille. At the latter mine the slack is washed and coked in a battery of Bernard ovens.

The following companies are actively developing their properties and are producers already or are about to produce: The H. W. McNeill Co., Canmore; the Breckenside and Lund Coal Co., Lundbreck; the Alberta Railway and Irrigation Co., Lethbridge; the Diamond Coal Co., Lethbridge; the Reliance Coal Mining Co., Taber; and the Canada West Coal and Coke Co., Taber. One of the companies mentioned above, the Alberta Railway and Irrigation Company, of Lethbridge, have installed a Rand B. 2 duplex non-condensing compound air compressor plant, capacity 2,848 cubic feet of air per minute at sea level. This is the largest compressor of its class made by the Canadian Rand Drill Company. Here also is installed a 200 k.w. generator manufactured by the Allis-Chalmers-Bullock Company, and driven by a 20x 20 direct coupled engine of the Robb Engineering Company's manufacture.

Considerable trouble is reported in the introduction of safety lamps in the Crow's Nest Pass mines. Satisfactory arrangements have now, however, been made. The scarcity of fire-boxes is remarked. The ordinary miner can make more money than the fire boss who is paid $3.50 per day. The average coal miner's wage, mining coal on contract, varies from $75 to $180 per month.

The general wages for day labor is as follows:

Inside Men.

		No. hours.
Fire bosses	$3.50	8
Shot lighters	3.00	8
Bratticemen	3.00	8
Bratticemen helpers	2.50	8
Timbermen	3.00	8
Timbermen helpers	2.50	8
Drivers	2.50	8
Drivers, wet places	2.75	8
Team drivers	3.00	8
Machine men	3.50	8
Machine men helpers	3.00	8
Tracklayers	3.00	8
Tracklayers' helpers	2.50	8
Rock miners	3.50	8
Miners	3.00	8
Miners, wet places	3.50	8
Laborers	2.50	8
Switch boys	1.50	8
Door boys	1.00	8
Hoistmen	2.75	8

Outside Men.

Pithead men	2.50	10
Slate pickers, men	2.00	10
Slate pickers, boys	1.25	10
Blacksmiths	3.50	10
Blacksmiths' helpers	2.50	10
Mine carpenter	3.50	10
Outside laborers	2.00	10
Machinists	3.20	10
Lampmen	2.50	12

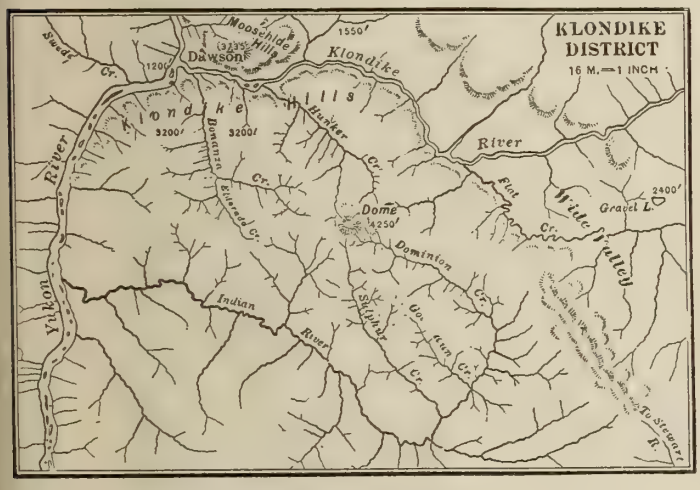
CONCENTRATION OF GOLD IN THE KLONDIKE.

J. B. Tyrrell.

The study of the origin of ore deposits is one of the most fascinating subjects of investigation which the mining engineer or geologist can undertake. The results of his investigations are, in most cases, sufficiently indefinite to escape final conclusions, but at the same time they constantly bring together new groups of facts and ideas which tend towards definiteness and raise hopes of conclusive results.

The uncertainty which hangs over our knowledge of the origin and mode of deposition of ores is especially marked in connection with the consideration of veins or lodes, but the mode of formation of many placer deposits is also not clearly understood, and the source and method of concentration of the gold or other valuable mineral has not been definitely determined.

In the midst of this uncertainty it is interesting to consider briefly the conditions that prevail in the Klondike district, Yukon Territory, Canada, a country of exceedingly rich gold-bearing placers, where the origin and processes of deposition and concentration of the gold into its present position are quite easily recognized and interpreted.



Map of Klondike District.
(Courtesy of Economic Geology)

The Klondike gold-bearing district lies in the basin of the Yukon River, just south of north latitude 64 degrees, and about fifty miles east of the 141st meridian which forms the boundary line between Canada and Alaska. It is more or less rectangular in shape, with a greatest diameter in a general east and west direction. Its total area as considered in this paper is about eight hundred square miles.

It is a well-defined physiographic unit, consisting of a mountain mass separated from all the surrounding mountains of the Territory, except at its extreme south-eastern angle, by deep and wide valleys, from which the land rises in easy slopes to a highest point near the centre of the area. The greatest relief is 3,050 feet, this being the difference in height between the bank of the Yukon River at Dawson, with an approximate elevation of 1,200 feet above the sea, and the summit of "The Dome" with an approximate elevation of 4,250 feet above the sea.

The district is bounded on the west by the valley of the Yukon River, which is one of the largest streams on this continent; on the north by the equally wide valley of the Klondike River; on the east by a great valley much wider than those just mentioned, that extends along the southwestern base of the Ogilvie Range of the Rocky Mountains and constitutes one of the principal topographic features of the Yukon Territory. On the south the valley of Indian River, a tributary of the Yukon, forms the boundary for the greater part of the distance, the exception being a narrow ridge at the south-east corner of the area, connecting these mountains with those to the south.

These mountains are not rugged pinnacles and ridges like the Rocky or Coast mountains to the north and south, but their summits are well rounded and their sides descend in gentle slopes into the valleys that radiate in all directions from the highest points. The bottoms of the valleys, too, both small and large, have very regular grades, and the streams that flow in them are not interrupted by either lakes or waterfalls. Some of the north-flowing streams have rather steeper and more gorge-like channels cut to depths of two or three hundred feet into and below the bottoms of the old flatter valleys, but even in these the grades are regular and continuous.



Bank of White Gravel.
(Courtesy of Economic Geology)

The country is largely underlain by schistose rocks which take their distinguishing characters from the presence of sericite, chlorite, graphite or quartz. They are all very old, geologically speaking, dating probably from Precambrian or Cambrian times, and have been very much folded, crumpled and twisted, and consequently they have been greatly altered from the eruptives or sediments as at first formed or deposited.

These schists are cut by many narrow veins, stringers and lenses of gold-bearing quartz, and while these veins, etc., are more numerous and probably more highly mineralized in some places than in others, they would seem to be present everywhere in these schists although in no place have they been found sufficiently closely aggregated, large or rich to pay for mining in themselves. However, they are very interesting and important, as the gold collected in the placers in the bottoms of the valleys was derived from them.

In a few places around the margin of the Klondike district outliers of sedimentary rocks of Eocene age occur. During this period the land would seem to have been lowered so that the present four thousand feet contour line

was at or near the level of the sea, for at this elevation the remains of a vast peneplain can be traced on the hills, not only of the Klondike district itself, but over great expanses of the Yukon Plateau which stretches away to the south and west, the rounded tops of the mountains, as seen from any of the higher summits, extending away to the horizon like billows on the ocean. The summit of the Klondike mountain mass evidently formed part of this old peneplain, though some of the largest depressions around and near it were undoubtedly marked out at that time. Assuming that this portion of the peneplain sloped down into the surrounding valleys, which were then submerged, the general elevation of the Klondike mountain mass, taking present sea level at a datum, was about 3,500 feet.

After the land was raised well above the level of the sea atmospheric agencies began the decomposition of the rocks, and the breaking apart and liberation of the rock particles one from another, while the rain and the smaller and larger streams cut out the valleys, dissolved parts of the rock, and washed the undissolved particles from the higher to lower levels. The very heavy particles, such as the grains and nuggets of gold, would settle close to the places from which they were derived, while the lighter particles would be carried farther away.

The process of decomposition and erosion, with transportation and separation of the eroded material, went on continuously from year to year and from age to age until the land had been reduced almost to its present level, and the bottoms of the wide and relatively shallow



View from Bonanza towards Gold Hill and the Town of Grand Forks.

At or shortly after the close of the Eocene period the land was raised above the sea, and it has not since been submerged, so that ever since then it has been continuously subject to decomposition by meteoric agencies, and to subaerial and stream erosion, the streams having assumed and retained normal courses outwards from the centre of the mountain mass.

The district lies in the unglaciated area between the glaciated Ogilvie Range of mountains to the north-east, and the much more severely glaciated Chilcat or Coast Range of mountains to the south-west, and while there is a possibility that during the glacial period it may have had some local glaciers of its own in the higher portions of its valleys, none of the glaciers from the north or south reached it, and there was no transportation of material to it from any outside source. Its problems of erosion, transportation and concentration are therefore entirely confined to itself.

valleys had been filled with coarse pebbles and cobbles of the harder and more resistant kinds of rock, though chiefly vein quartz, that had been slowly washed down from the adjoining hills. Mixed with these larger masses of rock were the smaller but heavier nuggets and grains of gold, which had been washed out of the same hills, but on account of their weight had not been carried away with the rock particles of the same size. The beds of quartzose gravel thus formed are locally known as the "white gravel" or "white quartz wash."

After these gravel beds were formed the northward-flowing streams were accelerated and given greater cutting power in some way, probably by a tilting of the land from the south northward, consequent on the continued rising of the mountains near the Pacific Coast. These streams therefore cut narrower valleys, with steeper sides, through the "white gravel" and into the underlying rock, leaving terraces of the "white gravel" on one



Ladder and Bucket Gold Dredge on Flat of Klondike River near mouth of Bear Creek.

or both sides of the valleys, and reconcentrated into their beds the gold from the gravel which they had cut through and washed away, as well as any gold that may have been in the rock cut through below the older gravel.

These two sets of gravel deposits have together produced to date about six million fine ounces of gold, and it is not improbable that there are still four million ounces remaining in the placers, making a probable total gold content for these Klondike placers of ten million fine ounces of gold.

As has been shown above, this gold was concentrated by the rills and streams from the whole of the rocky material washed down from the Klondike mountain mass, and it probably represents a considerable proportion of the gold originally contained or included in the rock.

In reference to the quantity of rock that was so washed down by eroding and transporting agents acting continuously through a long period of time, only approximate data are obtainable, but the following statement is believed to represent with a reasonable degree of accuracy the conditions as they existed during the erosion period.

As stated above the mean elevation of the land when active denudation began at the close of the Eocene period was 3,500 feet, taking the present sea level as a datum. The mean elevation of the district at present is about 2,600 feet above the same datum, from which it would appear that the thickness of rock removed from the surface between the end of the Eocene age and the present time is equal to a thickness of 900 feet over the whole area. Adopting the ordinary time scale of 4,000 years for the removal of one foot of surface, 3,600,000 years would be the time required for the removal of this 900 feet of surface, and such, according to this computation, would be the length of time since the close of the Eocene period. A thickness of 900 feet over an area of 800 square miles would equal a mass of 136 cubic miles or 1,600,000,000,000 tons of rock. This is therefore the quantity of rock that was removed by denudation, and from which 10,000,000 ounces of gold was washed and concentrated into the Klondike placers, and it represents an average gold content of 0.003 grains or 0.013 cents to the ton of the original rock in place.

It is thus seen that the Klondike district owes its phenomenally rich placers not to the wearing down of highly mineralized gold-bearing veins or lodes, but rather to the favorable conditions of long continued and uninterrupted concentration from a great mass of rock that contained only very minute quantities of gold.

THE DISCOVERY OF THE KLONDIKE.

By Major Henry J. Woodside.

Robert Henderson, discoverer of the Klondike, was born in Pictou, Nova Scotia, about fifty years ago. At the age of fourteen he ran away to sea, sailed around the world, and mined in Australia, California and Colorado.

In July, 1894, he arrived at Ogilvie Post, at the mouth of Sixty-mile River, Yukon. He outfitted with Joe Ladue, and contrary to advice, started with one companion, Collins, up the Indian River. They prospected on Quartz and other creeks, and late in the autumn had a dangerous and starving trip back to Ogilvie.

During the winter Henderson started alone with a sled load of supplies for Quartz Creek. He mined there until March, but found nothing. In the early spring,

through ice and slush, he moved his scanty outfit to the upper waters of Indian River, and began to prospect that district.

Here he was the victim of a ghastly accident to his leg which nearly ended his career then, and again on two perilous winter trips at a later date.

When the wound had partially healed, he spent the rest of the summer in his planned work. Toward fall he ran down to Ogilvie for supplies, and returned with Redford. They began extensive miner work on Quartz Creek, preparatory for general sluicing next summer.

After another visit to Ogilvie, Henderson spent the winter alone on Quartz Creek, working every day in "burning" holes through the frozen gravel to bedrock and drifting tunnels in search of the pay streak.

In the spring he washed up about $600 in gold. Then he crossed the ridge separating the Indian River and Klondike River basins, and found good prospects on Gold Bottom Creek (a branch of Hunker). He at once returned to Quartz Creek and induced some visiting prospectors to accompany him back. Four of them remained, and they began regular minerlike work, ground sluicing, etc. He crossed over the ridge between Gold Bottom and Hunker branches, and staked on what is now called Hunker branch.

When food began to fail, Henderson went via Quartz Creek back to Ogilvie. With a loaded boat he could not ascend Indian River, and was compelled to return via the Klondike.

Where Dawson now stands he found George W. Carmac, with his Indian wife and her relatives. He invited Carmac to come up and stake on his new find, then poled his loaded boat up the Klondike to the mouth of his own stream, and marked it on a blazed tree as "Gold Bottom" Creek. When he arrived in camp he found Carmac, "Skookum Jim" and "Tagish Charlie" there. After they had staked and Carmac was leaving, Henderson strongly urged him to test the gravel on Rabbit Creek (now Bonanza), and if he found anything, to send one of the Indians back and he would be paid. Carmac promised.

They camped on what is now called Discovery Claim, Bonanza Creek, just below the forks of Bonanza and Eldorado branches. While Carmac slept Skookum Jim panned gravel and found coarse gold. Next day they panned out $13, staked claims, and, forgetting Henderson, left for Dawson and thence to Forty-mile. Carmac's story was not believed at first, as he was neither prospector nor miner. Later a stampede set in, Bonanza and Eldorado Creeks were staked to their source, but for some weeks no one knew that the claims were of any value, and rich ones were sold for a trifle.

Be it observed that Carmac did not record his claim on his first visit to Forty-mile, but a month later, when as a result of some work, the richness of the ground was being shown. The regulations in those days allowed sixty days between staking and recording claims. By this means a new find could be tested before it was necessary to make a tedious journey to the recording office.

When Bonanza and Eldorado were being staked, two of the lucky ones, Andrew Hunker and Johnson, started over to see what Henderson had found. They went too far along the divide, and dropped down the wrong, or eastern branch of Gold Bottom, and testing the creek as they went, finally staked three claims below Henderson's stakes. They washed out $23 of coarse gold, and then hunted up Henderson's camp to show their prospect. The discoverer made the remark that they had found better prospects than he had. Recognizing that the name of the main creek was Gold Bottom, they tossed up in the presence of Henderson as to which should have the naming of the east branch. Hunker won.

When Hunker applied at Forty-mile to record his claim, the recorder did not acknowledge Henderson's prior staking, and also changed the name of the main creek to "Hunker." He gave Andy the discovery or double claim, entirely ignoring the real discoverer.

Henderson and his four companions divided up about $700 of gold among them, and when, still well within the sixty days regulations, he applied at Forty-mile for the record of a discovery claim made on Gold Bottom, one on Hunker, and an ordinary claim on Bear Creek, he was told that he could record only one claim in the "locality" (that is, one out of five staked). Having no recourse in those days from the recorder's decision, Henderson chose the half of his discovery claim on Hunker branch. It is now known as No. 3 above on Hunker. It and its mate have produced up in the hundreds of thousands of dollars' worth of gold.

But before its richness became known, the yearly representation work came due, and Henderson, still weak and penniless from a surgical operation and winter of sickness, could not get a reasonable extension of time, and was compelled to sacrifice it for $3,000 (equivalent to $500 outside) to Alexander McDonald, "King of the Klondike." He is from Nova Scotia, and had known Henderson in Colorado.

Owing to official carelessness and delay, Henderson also lost his claim on Quartz Creek.

He continued to prospect on the Klondike, on the Indian River, and on the Stewart River. He was the first to prospect "All Gold" and "Henderson" Creeks, which are now producing gold and will be valuable dredging propositions.

The Department of the Interior have by letter recognized the wrong done the discoverer by the recorder's refusal to record his properly staked claims, but has done practically nothing to compensate him.

The grim irony of a pioneer or discoverer's reward is seen in the despatch from British Columbia, that the Provincial Government have settled an annuity of $600 on Miss Fraser, the daughter of the discoverer of the Fraser River. As Miss Fraser is said to be dying, the generosity of the bequest is quite apparent.

Mr. Wm. Ogilvie, Yukon pioneer and ex-Commissioner of that territory, in giving Henderson the credit for the discovery, added that Carmac nearly lost the credit of being the accidental discoverer of Bonanza Creek. Two days after Carmac had staked, a party of miners searching for Henderson's new strike prospected and staked on Bonanza, several miles below the present discovery claim.

The attempt on the part of Seattle newspapers to give Carmac the credit for the discovery of the Klondike is due to the fact that he settled in that city with his easily gotten money. Robert Henderson, on the contrary, continues his work of exploring the mineral resources of Yukon.

As already pointed out, all the Governors and Acting Governors of Yukon, and all the leading pioneers, have by letter or by affidavit given Henderson the credit for the discovery. Mr. R. G. McConnell, the well-known geologist, who has personally looked into the matter, also calls him the discoverer. His work has added over $150,000,000 worth of gold to the world's supply, and has given Canada a wide and enduring advertisement. Personally, he is a fine type of pioneer and man, and he deserves well at the hands of his countrymen.

LONDON LETTERS.

ALEX. GRAY.

TEMPORA MUTANTUR PRO TEMPORE!

Whoever said mortals could stand everything but continual prosperity, anticipated that prevalent conditions in financial power houses are a species of "rest cure," a hiatus inherently heroic, essential to progression toward greater activity and vigor. "New business" is not being entertained; clearance sales can be made only at very great sacrifice; mining flotations are decidedly taboo; those who have funds are holding on to them; those who have no surpluses are unable longer to carry their deck loads of adversity. If you reverse the order, and instead of taking Medicine Hat forecasts of weather conditions the impasse here is accepted as index to the strains which all markets are subjected to, Canadian industrialism will be in less risk of really serious trouble such as envelops investment as well as speculative lines. There are sorrowings, but few borrowings without abundantly commensurate collaterals, and those seeking fresh capital realize more than ever the force of what Cecil J. Rhodes remarked to "Chinese" Gordon about the futility of "large ideas" when the wherewithal to demonstrate them is absent. Possibly the volume of home trade; the status of American affairs apart from Wall street; the monthly output of Witwatersrand gold, and the earnings of Canadian railways, Canadian bank clearances and what they represent are truer tests than the tapes in brokers' offices. Nevertheless there are so many disconcerting elements, it behooves the *Canadian Mining Journal's* clientele to revise their open transactions, to avoid hazardous commitments, unless liquid assets are certain not to congeal. The world's supply of paper is out of proportion to available funds in circulation, capital expenditure and issues have attained to the point where structural defects in one department threaten marvellous creations of the past ten years. Canada is no inconsiderable incident to the expansion. To preserve Canadian integrity, however, requires that the present reverse in speculative centers shall not result in a dibacle endangering what is merely the preliminary basis for the future exploitation of the natural resources of the Dominion.

Statistics of exports and imports are unimpressive when the banker curtails credits, the small shopkeeper complains of collections, and shrinkages in values become alarming. The economics are sadly askew. Never has London been so disconsolate, consequently so indifferent, to colonial representations. Somehow the investor has been alienated. What he has has the handicap of restricted markets; so we have the *Banker's Magazine* likening a valuation of stock exchange "securities" to "a survey of a district which has been afflicted with some devastating calamity." War wastes aggregating £300,000,000 are comparatively infinitesimal "when compared with the hundreds of millions lost even during the last two years by the depreciation of securities." What has been communicated to *The Canadian Mining Journal* therefore is justified. To be admonitory rather than trench upon the prerogations of the mining promoter who offers scip at a concession that will no longer be obtainable "next week," is preferable, when this carefully edited journal has the following:

[In normal times a net movement of fifty millions one way or the other in the list of 387 representative stocks usually reflects a substantial appreciation or depreciation, as the case may be, but already this year there has had to be chronicled for one month (March) a decline of 125 millions sterling, and now, for the month of August—a month not usually associated with violent fluctuations—there is a depreciation to record of no less than 136 millions, the exact figures being as follows: Aggregate value of 387 representative securities on 20th July, £3,633,717,000; ditto on 20th August, £3,498,130,000—a decrease of £135,587,000.]

Without elaborating these figures to the entire lists dealt in on 'Change in London, to say nothing of New York, Paris and Berlin, they are sufficient deterrents to financiers. Nor is there a compensatory feature beyond concurrent necessity. Where there might have been sanity—in the manner of intramural transportation facilities—a surfeit of official and unofficial competition has created nothing but debit balances, or so reduced profits that dividends are microscopic or are passed. London, for instance, went motor mad, while its underground railways and tubes confess to carrying millions for less than shareholders would receive if they held consols at to-day's prices. The horse omnibus being no longer the fashion, the promoter and motor manufacturer catered to the popular desire, without profit to shareholders, because of ruinous rivalries. Nor is the initial outcome of the latest flotations astonishing when the balance sheet of the London General Omnibus Company for the half year ended 30th June—published to-day—shows a working loss of £52,413. In the period reviewed, 99,836,805 passengers were carried, as against 108,341,451 in the corresponding 1906 period, and the average receipts per passenger per omnibus per day was £2:4:1, as compared with £2:6:2. And this concern is affiliated with the potent name of Lord Rothschild! "Inclement weather and increased competition," are causes assigned. Co-operation in the maintenance of higher fares underground and at surface is now proposed, but fixed charges are more apt to increase than decrease, as has been the case with the steam railways, the chairmen of which are unanimously lachrymose; hence this gloomy contrast btween prices of 1896—the year in which the American movement began—and to-day's quotations:

DEBENTURE STOCKS.

Company.	Mean price, 1896.	Yield. £ s d	Pres'nt price.	Yield. £ s d
Caledonian, 4 pc.....	157	2 11 0	113	3 11 0
Great Central, 4½ pc..	164	2 15 0	119	3 15 6
Great Eastern, 4 pc....	154	2 12 0	111	3 12 0
Great Northern, 3 pc...	119	2 10 6	86	3 10 0
Great Western, 2½ pc..	99	2 10 6	72	3 9 0
Lancs. and Yorks, 3 pc.	119½	2 10 0	85	3 11 0
Lon. and N.-West., 3 pc.	120	2 10 0	88	3 8 0
Lond. and S.-West., 3 pc.	121	2 9 6	87	3 9 0
Lon. B. & S. Coast, 4 pc.	156	2 11 6	110	3 13 0
North British, 3 pc....	116	2 11 6	85	3 11 0
North-Eastern, 3 pc....	119	2 10 6	85	3 11 0
South-Eastern, 5 pc....	192	2 12 0	133	3 15 0
Taff Vale, 3 pc.....	115½	2 12 0	84	3 11 6

PREFERENCE STOCKS.

Company.	Mean price, 1896.	Yield. £ s d	Pres'nt price.	Yield. £ s d
Caledonian, 4 pc.....	152	2 12 6	111	3 12 0
Great Eastern, 4 pc....	149½	2 13 6	106	3 15 6
Great Northern, 4 pc...	154	2 12 0	106	3 15 6
Great Western, 5 pc....	191	2 12 6	137	3 13 0
Lancs and Yorks, 4 pc. Gtd.	154	2 12 0	112	3 11 6
Lon. and N.-West., 4 pc.	155	2 11 6	113	3 11 0
Lon. and S.-West, 4 pc.	155	2 11 6	110	3 13 0
Lon. B. & S. Coast, 5 pc.	189	2 13 0	125	4 0 0
North-Eastern, 4 pc....	154	2 12 0	111	3 12 0
South-Eastern, 5 pc....	186½	2 13 6	127	3 19 0
Taff Vale, 4 pc.....	148	2 14 0	103	3 18 0

An advance of about 40 per cent. in the return upon these securities, with money less valuable, would be quite satisfactory were it not for disparities in market prices clearly indicating that the British buyer of to-day is more discriminating than he was a decade ago. These depreciations are arguments in favor of colonial securities and industrial shares yielding higher rates; yet they denote the impotence of purchasing power crippled beyond the patence of those who thought home rails as good as "Goschens." In reality there is little difference, because "Goschens," while indicating a drop of 25 per cent. in market value, are paying 3 1-20th per cent. on current prices, as against 2 3-10th per cent. in 1896. This correlation might be extended indefinitely to prove that public issues, though "gilt edged," are too slow an asset to suit the investor who cannot afford to create a reserve fund against all contingencies. It is contended that as India 3½ per cent. are 20 points; Liverpool 3½, 34 points; London County Councils, 28 points lower, this is "the investor's opportunity." Perhaps it is, but if shrinkages here and in other directions are taken to account, it will be easier to understand the hesitancy of monied people when confronted by municipalizations galore and pro-socialistic legislation ad lib. In the eight months of this year the 387 stocks dealt with by the *Bankers' Magazine* record a loss in market value totalling a third of a billion pounds sterling—111 millions being debited to American rails, 48 millions to British funds, and 36 millions to English railway ordinary issues. American disparities, as enumerated, are only a fraction of losses sustained. South African Mining and Exploration Company shares in August added another 25 per cent. in gall and wormwood to the cup. Not many of these months would spell ruin. Nor have bank shares escaped, since consols on the toboggan were certain to drag all else with them. It could not very well be otherwise where the one tonic available—the Witwatersrand gold—is threatened, and onslaughts are aimed at the public purse and private enterprise by those who maintain the State owes them special benefits as compensation for studied improvidence.

When Lot's wife became concretedly saline, her offence lay in reprehensible retrospection. The old world and a part of the new is nursing many petrified hopes. Canada has less bad debts in her books and a wider range of opportunity, so moralizing yonder may be relegated to futurity, pending the provision of capital to enable it to state terms rather than supplicate for them. What the Mother Country does not know in detail of the Dominion will be learned intelligently. Better so than to have it unlearned in manner and form akin to American land grabs, granger railroads and credit mobilier episodes. To indiscriminately press forward mining and land ventures ahead of transportation and essential economies is to invite activity at the cost of a reputation worth fostering. Taking South African balance sheets of two or three years ago as "horrible examples" of what Lord Milner characterized as "incorrigible optimism," there is need of that prudence which asserts the consciousness of Canada's potentialities and the desire for something other than market rigging. Over-capitalization, gross errors of estimation, bequeathed to South Africa as a heritage of distrust, Canada has the "large ideas" of Rhodes, and the money for them will come along in natural order if the public domain is conserved and the public interest is promoted. South Africa's "Golden Calf" has a "gamey" flavor approaching putridity. Canada is at the portal leading to prosperity. I offer the following as a picture of what is sticking in London's mind's eye:

"The state of things on the Stock Exchange is probably without parallel in the history of that institution. Hitherto the slump has mostly hit the smaller men, but although there have been no hammerings, the careers of two really large firms have been closed since last account, and a number of other quite important houses are known to be facing the situation with haggard anticipations. One wealthy firm in the mining market is discharging its clerks and retiring in disgust and despair from the so-called "business." It is really too bad that the Stock Exchange Company and the Stock Exchange Committee should sit like so many Turks with folded hands and uplifted eyes without attempting anything to "stay the rot." At any rate, an official scale of brokerage, forbidding rebates, would help the commission houses to pay their expenses."

London, August 27th, 1907.

CANADA'S OPPORTUNITY.

Liquidation variously attributed to the slump in American shares, depreciation of consols, and political programmes provocative of uneasiness in big financial houses, combine to deter investors from further commitments. Several Canadian tansactions of moment have been shelved as a consequence, mining ventures are at a discount, banking privileges are restricted, and a period of dearer money is inevitable.

No section of the London and Continental markets concerned has escaped the gruelling incident to operations of late. Probably Canadian corporations and projects have more genuine sympathy, where that element counts for substantial contributions when the spirit of liberality pervades the city; but no secret is made of the fact that large movements are now accompanied by hazard, and will be until Western crop movements are completed. The Rooseveltian crusade against gargantuan combinations is more clearly defined, and the outlook as to the indispensable yellow metal output of the Witwatersrand is less obscure. Canadian industrial undertakings, bona fide and not too precarious, necessarily suffer because of all these complications, but the postponement of impending flotations should not be detrimental. To the contrary, the willingness with which financiers enter into British North American promotions, when properly vouched for, is the very best assurance that your hoizon of hope is broadening; all that is required is a revival of general confidence and fresh demonstration of Canada's capacity. Money is the decisive factor as always. The shrinkage in credits throughout, and the inadequacy of the world's supply of capital for the stupendous volumes of business, are disconcerting to unprecedented degree. With it all, clamorous democracies in various ways are pressing for measures equivalent to modified confiscation of property rights; hence no immediate relaxation in funds is expected. Money has added purchasing power, but sustained losses in so many directions are accepted as admonition all-sufficient by financiers and underwriting syndicates to leave those who sow extremist sentiments to reap remorse.

Were it not for the scrip "jam" there would be more receptivity toward Canada, although Cobalt promotions will have to wait. Consols at 81½ and a "no bottom here" look about South African shares, together with the apprehension reflected in the prices obtaining for home rails, adversely affect the attractions Canadians offer. The "silly season" suggestion that consols be made legal tender at par, despite the readiness of holders to part with them at 82 or 83, is symptomatic of all that is transpiring. To disguise the causes without adopting

remedial policies is to invite topsy-turvitude; so there will have to be universal readjustments—and Canada is specially fortunate in having fewer open accounts.

South Africa is in a woeful plight. Dissension and despair and the impossibility, without cheap labor, of winning gold at a pace to pay interest on share and debenture issues distributed at inflated prices, are argument against mining ventures. Parent company paper represented by cash, cash assets, and fixed property, are worth less than at any time during the late Boer War. A lopping off of £200,00,000 in "Kaffir" market values, minimizing credits closely related, much more than that dissipated in the American dibacle, all conduce toward the distrust reflected in the weakness of consols and British railways. Perhaps Canada has not attained to that pretentious position where it can command capital despite adversity elsewhere. It is well understood that money is a pressing Canadian prerequisite. Your needs can be supplied if the tactics of promoters are directed to the permanent welfare of the Dominion rather than to immediate realizations on forced market opportunities. As one creditable Canadian remarked to an underwriter or overwriter the other day when asked if a "market is at once to be made for certain debentures," "No, sir; that is not my business. You are getting 4½ per cent. debentures at a low price; the flotation promises more than is represented in the prospectus, and if you do not care to hold the security you must make your own market."

To say this involved moral courage. When Canada applies this principle more generally financiers will be less prone to assume that all mining ventures "look alike to me," and that the prospectus is not merely a preliminary to summary offloading by vendors.

When revising a former letter, the impression formed was that the views recorded were doleful, probably to an extent at variance with Canadian perspective. Upon going through the London dailies a day later, I find I have erred on the side of conservatism of statement. The Express, whose financial editor is on intimate terms with an influential section of city men, is the dispenser of the following, the conclusions being well founded, apart from those involving Mr. Roosevelt, who has simply emphasized the evils according to Harriman:

"The financial sky is still gloomy, and before markets sail into smooth waters some dirty weather will probably be met with. Kaffirs have been killed by the Liberal party, and the American market has been assassinated by President Roosevelt—just at the wrong time of the year. A general holocaust of values has been in process, and the absolute certainty of a 5 per cent. bank rate—at least—at an early date is assured. Under these circumstances, to revert to the original metaphor, speculators for the rise may be strictly enjoined to keep off a lee shore and rid themselves of as much top hamper in the way of contango stock as possible while riding out the storm. Fortunately, there never was a time when open accounts in the House were of smaller volume than now, and the bank position is sound enough. For these reasons no panic is to be expected, and there is nothing to justify the jettisoning of good stuff which has been paid for and taken up."

The writer is rather alarming. He is not alone in this, for the financial editor of the Chronicle simultaneously says:

"It is still impossible to discern any encouraging symptoms of a coming improvement in markets. Liquidation continues in various directions, and the stream is by no means dried up. It is no secret that many firms have experienced the greatest difficulty in keeping their heads above water; that many were assisted at the recent settlemnt; that some are still receiving help, but it is to be feared that such troubles cannot be permanently removed except by a sustained and considerable appreciation in prices. Unhappily, such a prospect is not visible as yet, and this patching-over of difficulties cannot remove the anxieties they have created. If we could look for some alleviation from New York, markets might be able to cherish a few hopes, but all authorities agree with what we said yesterday—Wall street must face further liquidation. Professionals tried to cheer each other up yesterday by declaring that the worst of the liquidation is over, but things looked most cheerless all the same. In a very sluggish gilt-edged market Consols were comparatively firm, with a gain of 1-16 to 81 11-16."

Bad weather ahead, succeeding similar weather, justifies the attitude of capitalists. Presently, with a little patience, Canada should, and will no doubt, have its opportunity.

PERSONAL AND GENERAL

The Hon. Robert Drummond, editor of the Maritime Mining Record, has been appointed one of a Commission of four, to report upon the feasibility of old age pensions, for the Nova Scotian Government.

Mr. Louis J. Abrahams, of Ely Place, London, England, left Toronto for New York and England on September 5th.

Mr. J. W. Rawlins, chief chemist of the Canadian Copper Company, Copper Cliff, Ont., is spending his holidays in Toronto.

Mr. A. A. Hassan, mining geologist and consulting engineer, has opened Canadian offices at 25 Toronto street, Toronto, Ont. Mr. Hassan has organized the "Hassan Exploration Company of Canada, Limited." The prospectus of this company was regularly filed in the office of the Provincial Department of Mines.

Mr. Frank Loring has resigned his position as consulting engineer of the Trethewey mine, and will henceforward make Toronto his headquarters. Mr. Loring has done clean and effective work in Cobalt. His advice has been sought by many of the more important interests there, and he has reported upon many of the larger properties. The McKinley-Darragh and Foster were examined and reported upon by him. Mr. Loring, as a citizen of Cobalt, as an employer of labor, and as a mining engineer, has exercised a strong and healthy influence. We wish him all success in his new sphere of activity.

Captain D. J. Kennelly, of Louisburg, died on the 28th of August at the Brooklands Hospital, Sydney, after an operation for cancer, at the age of 76. Captain Kennelly was for many years manager of the Sydney & Louisburg Coal and Railway Co., and resigned his position when that company was merged in the Dominion Coal Co. For many years Captain Kennelly has been a well-known figure at Louisburg, in the historic history of which place he was deeply interested. He inaugurated a movement for the preservation of the ruins of the French occupation there, and endeavored to create a fund for the Louisburg Memorial to the dead of both the nations who fought so gallantly for the possession of this island.

Captain Kennelly had an adventurous and varied career, having witnessed active service in the Indian Mutiny. He was a man of varied attainments, being a barrister of the English bar and a K.C. of this Province.

He was a gentleman of an old school, and a link with the days when our Empire was passing through stirring times. His death removes one of the most interesting figures connected with the earlier days of the Cape Breton coal trade.

EXCHANGES

Technical Literature, August, is replete with information. The leading article is on Canadian hydraulic canal locks.

The Mining Journal, August 17, concludes an editorial article on American and German demand for British iron with the assurance that a brisk autumn trade in most branches of the iron and steel industries is practically certain.

From The South African Mines, Commerce and Industries, July 13, we learn that of the sixty-two Rand companies which earned profits in May, exactly one-half made less than ten shillings per ton. "A considerable proportion of the £780,000 profit which the mines made in May was derived from these ores, which yield profits of less than 10 s. per ton."

The Colliery Guardian, August 16, editorially discussing the timbering of coal mines, alludes to falls of side and roof both in working places and roadways. The Guardian claims that too close observance of the special rules laid down by the British inspectors is one of the causes of these accidents. Although the maximum distance between supports, as fixed by the special rules, is not too great for ordinary conditions, yet the mere existence of a legal limit tends to deter the miner from using his discretion.

The Mining Reporter, August 22, presents an article on a Chamber of Mines recently organized at Los Angeles, California. The Chamber will employ two staffs of inspectors, commercial and technical. Upon payment of certain fees, certificates will be granted to reputable mining companies. The Chamber's certificate and registration seal can, however, only be used subject to certain restrictions. The plan has been tried before without success. But there is no reason why, under present conditions, it should not be successful.

The Mining World, August 24, contains a thoughtful article on Cobalt by Mr. Ralph Stokes, the World's travelling correspondent. In its editorial columns the Mining World expresses the opinion that the needs of initial equipment for Cobalt mines is typically light. A considerable amount of mining has been done with a minimum or very light equipment, but the producing mines have respectably large plants. The irregularity of the veins and the fact that the rock encountered is hard to drill, make the compressed air requirements larger than usual. Another consideration is that on much of the ore shipped only silver values are paid for.

The Iron and Coal Trades Revew, August 16, comments upon the recent advances in colliers' wages. Since June, 1906, for instance, South Wales colliers' wages have advanced from the minimum to nearly the maximum. "What is now earnestly desired," remarks the Review, "is an increased output. . . . Nearly all the principal collieries have paid a dividend of 10 per cent. for the first half of the present year, in addition to having expended large sums in the improvement of plant and machinery, opening out new workings, etc., for the sole purpose of increasing their output. The probability of a bill being passed during the next session of Parliament for limiting the hours of colliers' labor underground has had something to do with this, for as the output per man must necessarily be reduced, a larger number of men must be employed to maintain even the present demand, and foreign consumers may apprehend in this move another advance in the price of coal."

The Monthly Mining Report of the Chamber of Mines of Victoria, Australia, for May, contains an account of the recommendations of a late Royal Commission on State forests and timber reserves. The Commission strongly recommended, among others, the following propositions:

Independent control of the forest reserves and the withdrawal of the administration from ministerial control.

The dedication in perpetuity of "Reserved Forests," which term will include all permanent reserves for the growth of timber, or for climatic reasons, or for both purposes.

The demarcation on the ground of all "Reserved Forests" which have hitherto not been surveyed within a fixed period.

The protection of the reserves and Crown lands from the misuse or careless use of fire.

The encouragement of tree planting in bare, treeless districts.

An unusually luminous editorial is that on "Crystals and Water in Veins," in the Mining and Scientific Press, August 17. After appreciating Waldemar Lindgren's essay on "The Relation of Ore Deposition to Physical Conditions," our contemporary mentions and emphasizes one factor in the distribution of ore in lodes—the water zone. "It is pretty clearly ascertained, especially among mining engineers and others in daily touch with underground operations, that there is a definite layer of water, the *top* of which has long been known as the 'water-level.' The bottom of this zone of water has not been recognized, simply because the sinking of shafts tends artificially to depress it; for the lateral workings of a mine, by draining the adjacent area, cause the shaft to act as a pump. Miners know that at a certain level they get below the maximum seepage, and in large mines the pumps are placed so as to 'take up' that water . . . Below the water zone the lode becomes dry, even dusty, so as to imperil the health of miners."

In the Engineering and Mining Journal, August 24, Mr. Joseph Daniels writes interestingly on "Methods of Paying Miners' Wages." Constant readjustment between the operator and the miner has resulted in a number of systems of payment of wages based on local economic conditions. Day's pay is the simplest and most universal method, and is applied largely to unskilled labor. In the contract system both quantity and quality of work count. In most American coal mines coal is paid for by weight at the bank-head scales, although narrow work is paid for by yardage; the price of yardage being computed on the average number of tons of coal in a cubic yard. In metal mines development work is usually paid for per foot or yard of advance. Under the "Hole Contract" system payment is made at a certain rate per foot drilled. Firing and loading are not included in the contract. The tribute system, in which payment is based on the value of the mineral extracted. The Colorado lease system is based upon the old Cornish tribute system, but it has eliminated many of the latter's uncertainties and disadvantages.

The Chemical Engineer has moved its office of publication from Philadelphia to 355 Dearborn street, Chicago, Ill. The editor's office is still in Nazareth, Pa. The July number of this monthly has a paper by Dr.

Charles B. Dudley, entitled "The Enforcement of Specifications." Dr. Dudley traces the evolution of the specification: "In the early days of specifications they were little more than attempts on the part of the consumer to tell the producer what he wanted. Especially after it became the custom to consult the manufacturer in making the specification, it took on a new meaning. At first it was a demand; it now became an agreement. . . . Testing was never intended to be a device to bring about the acceptance of inferior material, but quite the contrary. . . . Is not the time near at hand when engineers and their principals will be compelled, if not legally, then by force of public opinion, to acquire by the establishment of laboratories and means of testing, by the making and enforcement of specifications, such knowledge in regard to the materials they are putting into structures as will give the public greater security than it now has against disaster."

CORRESPONDENCE

Ottawa, Sept. 5th, 1907.

Dear Sir,—

As the new Department of Mines has been so lately created, and as there seems to be some misunderstanding concerning the authorized status of its branches and chiefs, the Acting Deputy Minister has instructed me, in order to prevent further misunderstanding, to call your attention to certain inaccuracies that have crept into your articles in regard to Mr. A. P. Low and Dr. E. Haanel.

In the first article it is stated that Mr. Low is "Director of the Geological Survey, now officially designated the Department of Mines." The sentence should have read that Mr. Low is Deputy Minister of the Department of Mines and Director of the Geological Survey.

In the second article, Dr. Haanel is made to appear Director of the Department of Mines. That gentleman is Director of the Mines Branch of the Department of Mines, which with the Geological Survey combines to form the new Department of Mines.

In the second article it is also stated that the office of the Mines Department "has been removed to the Thistle Building in Ottawa." This statement is rather misleading. The office of the Mines Department is in the Geological Museum Building, Sussex street, and the Mines Branch has temporary offices in the Thistle Building, Wellington street.

Yours truly,

PERCY H. SELWYN,
Secretary.

The Editor "The Canadian Mining Journal," Confederation Life Building, Toronto, Ont.

BOOK REVIEWS

SHAFT SINKING UNDER DIFFICULT CONDITIONS—BY. J. RIEMER. TRANSLATED FROM THE GERMAN BY C. R. CORNING AND ROBERT PEELE. ILLUSTRATED WITH EIGHTEEN ENGRAVINGS AND NINETEEN FOLDING PLATES. NEW YORK, JOHN WILEY & SONS. LONDON, CHAPMAN & HALL, LIMITED; 1907; pp., 176; 8 VO. CLOTH, $3.00.

This timely treatise is divided into four sections:—I. Shaft-sinking by Hand; II. Shaft-sinking by the Boring System; III. The Freezing Process; IV. Drop Shafts.

I. Section one is prefaced by a statement that may not be accepted by mining men on this continent. The author asserts that no mechanical process of sinking has as yet successfully displaced sinking by hand, "which, when at all applicable, still maintains its predominance over other methods."

In this section reference is made to the use of hanging scaffolds, by means of which masonry lining may be put in place simultaneously with the actual sinking operations. The use of and improvement of the old Cornish pumps, steam sinking pumps and Tomson's method of bailing by means of the permanent hoisting engine are outlined. Stationary pumps are now no longer customary for shaft-sinking.

Records of German shaft-sinking are given and a comparison is instituted between the boring, freezing and drop shaft systems and ordinary hand work. "Sinking by hand will have the preference, both because of its efficiency and lower cost, in every case where it can be used at all, even though the flow of water be considerable." There are, of course, conditions where the flow of water is so great that hand work is impossible.

II. Shaft-sinking by boring an entire shaft in a single operation, carried on under water, is outlined in this section. Originally the procedure was merely an extension of that followed in sinking artesian wells. The adoption of the plan of drilling an advance bore, by a small tool or trepan, from one-third to one-half the full diameter of the shaft, facilitated the removal of drillings and kept the shaft plumb. The method is applied only after a portion of the shaft has been sunk by hand labor and ordinary pumping, and when no further progress by these means can be made. In cases where large quantities of water are anticipated, the use of the boring system would usually be a foregone conclusion. The plant required is large and costly. The trepans used are huge affairs, a smaller size weighing 22,000 pounds and a larger one 52,800 pounds. A full description of the process and its limitations is given in this section. Complete data of actual operations are included in narrative and tabulated forms.

III. The Freezing Process, brought out by F. H. Poetsch in 1883, had been used in Wales in 1862. In Siberia the severe climate permits of the alternate freezing and excavation of the shaft bottom.

The process is applicable to soft and unstable ground, containing large quantities of water, in which ordinary hand-sinking cannot be carried on. The modern improvements of the process are touched on and operations are adequately described in this portion of the volume. Logs of shafts sunk in Germany, Belgium, the United States, Holland, France, England and Austria, are tabulated.

IV. The Drop-shaft method for sinking in sand or loose water-bearing soils is one of the oldest in use. The method originally consisted in erecting a strongly framed rectangular wooden casing and allowing the casing to sink slowly into the shaft as it was being sunk. The wooden casing was succeeded by a circular walling of masonry, first with a wooden, afterward with an iron, shoe. A plate iron cylindrical lining and, later, a cast iron tubing with machined joints superseded this. Drop-shafts were first sunk by their own weight; then by loads of earth, stone or iron; and eventually by the use of jack-screws and hydraulic jacks. In modern practice a large number of hydraulic jacks are connected with an accumulator, weighted for exerting a constant pressure on the drop-shaft.

The weaknesses and causes of failure in this variety of shaft-sinking are well illustrated by another series of working instances. As in the preceding sections, precise and exact data are included.

The volume is supplemented by a series of folding plates.

As the scope of Canadian mining is increasing, conditions must arise more frequently under which shaft-sinking in loose and watery soil will be necessary. A book such as this contains a mass of information invaluable to the mining engineer who must sink a shaft under such circumstances.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

SPRINGHILL.—The strike in Springhill still continues. It is to-day wearing its most serious aspect. Many may wonder what has caused such a condition of affairs. The local papers have done much to muddle the public as to the cause of the present trouble. A certain number of miners in a section of the mine demanded an increase on the price per box, for which the management considered they were already receiving top prices. The management refused the advance. The men referred the dispute to a Board of Conciliation under the Lemieux Disputes Act of 1907. The management were very willing to allow the matter to go before the Board. The Board was therefore legally appointed. Two cases were given the Board to decide. The Board sat for three days, giving ample time to bring forward all possible evidence from both sides. The Board at its final sitting awarded one case to the men, and the other, including the increase of price per box, was awarded in favor of the company. In the meantime the men made reference to another Board for settlement of a difference. This also was accorded them. The men, however, previous to this had got notice of the awards of the former Board, and at a meeting of the lodge repudiated the finding of the Board, and further notified the management that if their demands were not conceded in full they would strike on August 1.

The new Board met on July 31 and the miners presented their side of the question. The court adjourned to meet the following day. On the evening of the 31st July a meeting of the lodge was held, with two hundred and fifty present out of nine hundred members, one hundred of whom were disqualified as voters on account of non-payment of dues. A secret ballot was taken amongst those qualified to vote, which resulted in ninety (90) voting for strike and sixty (60) against. By such a small majority were the town and works plunged into all the loss and anxiety of this disastrous suspension of work. According to adjournment, the new Conciliation Board met on the morning of August 1 to continue the investigation; but as the men were on strike on the finding of a former Board, the Chairman (Judge Patterson of Pictou County), after expressing his regret at the action of the men, quietly adjourned the Board to meet again when needed or called for.

Many of the men have left the town for other localities, a few temporarily. Many of those not in favor of the strike have found jobs as near at hand as possible, waiting for the works to start again. A few of that class who care little whether they work or play are hanging around and working odd days on the streets. A system of alms-giving has been established by the labor organization to which these men belong, and it does not say much for the manhood of our Nova Scotia miners when they prefer that to an average wage of $3.34 per day made by honest work, even in the places where this increase was demanded. It is to be regretted that the law-abiding element which we know really exists among the men, is not more in evidence. Were it so, law and order would prevail, and much suffering be averted. The management in not conceding the workmen's demand in this instance is simply upholding law and right.

W. D. M.

SPRINGHILL, Aug. 27.—The strike still continues. All of the horses are taken out of the mines. The officials and a very few laborers are working to keep the mines in running order. The mechanics—engine men, pump men, etc.—are still at work, although it was thought at one time that they also would join the strikers. However, the wiser element prevailed.

The company has placed weigh scales on Nos. 2 and 3 bankheads for the purpose of weighing the coal as it comes from the mine. Hence a new era will be established in the method of paying miners for their work. Previous to the strike the coal cutters were paid by the car; hereafter they will be paid by the ton.

There is nothing as yet to indicate a breaking of the strike. The strike itself is remarkable for the very quiet manner in which it is being carried on. There is some newspaper skirmishing going on however.

Quite a number of men have left the locality, some going west, but the majority scattering to the neighboring mining localities. These latter intend to return as soon as a settlement is reached.

Some places of business have closed their doors. Others are open, hoping for peace in the near future. All are anxious, as the situation is becoming desperate for the town and its people.

HALIFAX.—At the Annapolis Iron Company's Torbrook mines, No. 2 shaft is down 150 feet. The Dominion Atlantic Railway extension to the mines is nearing completion. No. 1 shaft will presently be reopened. It was closed down whilst the Londonderry furnace was under repair. The furnace will very soon be put in blast again, and ore shipments from No. 1 shaft will then be resumed.

No. 2 shaft is being sunk on a superb body of high-grade hematite. The ore is holding in quality and quantity as sinking proceeds. Levels will be driven at 80 feet, 160 feet and 240 feet. Thirty-five men are now employed in this shaft.

September 9th is the date set for resumption of work on No. 1. The management will then need about seventy-five men.

Recently Mr. T. J. Drummond, of Montreal; M. Woodward, of Paris; and Mr. W. F. C. Parsons, the mining engineer of the company, inspected the mines and visited several places near Annapolis, where they examined proposed sites for shipping piers for the company. The shipment of ore to domestic and foreign consumers is part of the plans of the company. At present the Londonderry Iron and Mining Company's blast furnace at Londonderry, Colchester Co., is the only user of Torbrook ore.

SYDNEY, N.S.—The executive of the Dominion Iron and Steel Company has decided to make Wabana iron ore a source of revenue. Larger installations will be put in and ore will be mined for sale and export. Moreover, the company's coal areas are to be developed. Both of these moves are wise.

QUEBEC.

LABELLE.—Mr. E. A. Howarth, of the Morgan Crucible Company of London, England, visited the Labelle Mining Company's mine on August 19th. Mr. Howarth was exceedingly pleased with the showing of graphite and the quality of the mineral. His inspection was made with a view to purchasing the property for his firm.

The Northern Mines, Limited, controls the surrounding country and has a prospect that thoroughly warrants development. It is situated one mile from the C. P. R., and a spur line to its mine is nearly finished. The district here is well worth investigating.

BRITISH COLUMBIA.

THE KOOTENAYS.—The scarcity of coke, that commodity which is so essential to the mining and smelting industry of this district, reached an acute stage a fortnight or so ago, resulting in the partial suspension of mining and smelting operations and the temporary laying off of many mine and smelter employees. Shipments of ore were cut down and many of the blast furnaces were "blown out." However, the general public accepted this condition in a philosophical spirit, and everyone felt that a few weeks would see things much changed for the better. These hopes have been realized to a limited extent; coke has been coming into the district a little more freely; but still there is more or less of a shortage. Ardent overtures have been made to the Government and at the present moment Mr. R. F. Tolmie, Deputy Minister of Mines, is in this territory investigating the coke question. Much complaint is heard of the Crow's Nest Pass Coal Co. shipping large quantities of coke to smelters on the American side, contrary to the terms of its charter, when the coke is really required in British Columbia. Exception is made to the Northport smelter, which treats the ores of Le Roi mine, Rossland. It remains to be seen what foundation there is for this cry. It is stated there are two sides to the story.

There is a marked shortage of labor along the Crow's Nest Pass Line of the C. P. R., and many of the employees of the coal mines have gone to work in the fields. This lack of help is likely to continue until after harvesting is over.

There is also more or less shortage of cars throughout this country, but relief is expected in this quarter in a short time.

The decided drop in the price of copper has naturally thrown a shadow across the bright path which the copper propositions were following.

At Rossland the Consolidated M. & S. Co. have cut down their ore shipments and are devoting their attention to development work. Le Roi is not shipping ore, with the exception of about 680 tons on Aug. 30th, which had accumulated in the bins during development which they are carrying on. The mine on the 1650 level is in good condition, the important work they have had in hand there now being nearly completed. The Northport Smelter is closed down completely, but coke is accumulating in their bins and operations will be resumed, it is stated, in a couple of weeks at most. The Trail smelter of the Consolidated people is running light, coke being scarce with them too. Development work is being actively prosecuted at the Le Roi 2, Limited; Giant-California, Jumbo and White Bear. Le Roi 2, Limited, and White Bear are on the shipping list. Rossland ore shipments were 3,485 tons for week ended Aug. 31st.

In the Boundary Country the coke shortage has affected them more or less. At the present writing ten out of fourteen blast furnaces there are in operation, but it is nip and tuck to keep them going. Granby are operating five of their furnaces, B. C. Copper Co. two, Dominion Copper Co. three. The usual mining operations have been carried on.

The big consolidations seem to have great faith in Phoenix camp, and affairs with that town look bright. The Granby, B. C. Copper Co., and the Consolidated people have each bonded a number of claims and are prospecting them with a view to purchasing those which prove of value. The shipments of ore from the Boundary amounted to 22,811 tons for the week ended Aug. 31st.

Diamond drilling is being done on the B. C. Copper Co.'s Oro Denoro property. The Granby Company is placing an order for coke in the East to insure a plentiful supply. The Granby has a force of about twelve doing development work on its Independence property in the Similkameen. Boyles Bros. have just finished doing 1,000 feet of diamond drill work on the Boundary-Elkhorn Company's property.

The recent cave-in at the Granby's Brooklyn Mine, Phoenix, has disclosed a hitherto unsuspected ore body.

At the Consolidated Company's St. Eugene property at Moyie more men are now employed than have been for some time. The usual output of ore is being produced and special development work under way.

The Sullivan, Rambler, Krao, Payne and other mines in Slocan and East Kootenay districts are working steadily along the usual lines.

With a plentiful supply of coke, sufficient labor, and a reaction in the price of copper, mining affairs here and in the Boundary would brighten up materially.

ONTARIO.

WABIGOON.—A party of directors and stockholders of the Victory Gold Mine, accompanied by Enrique Tonceda, C.E., M.E., made a lengthy examination of their mines and areas. The Paymaster, the Detola and the Laurentian Mines were also visited.

COBALT.—The bulk of Cobalt ore shipments still go across the border. Of the 1,237 tons shipped during August only five cars went to Copper Cliff, one to Toronto, and one to Swansea.

At the Coniagas, 3,000 feet of cross cutting and drifting has been driven. The concentrator will be in commission some time in September.

Diamond drilling exploration is being carried on actively at the Trethewey. Almost full shifts are worked at this mine.

The Drummond Mine is operating once more. It has a fair complement of men and drills.

The Imperial Cobalt, otherwise and better known as the Evans Mine, was the first shipper from Portage Bay. Mr. J. W. Evans, after whom the mine takes its name, was one of the pioneers of the Portage Bay district, and his mine was the first to make a shipment. The shipment, consisting of about 20 tons of high grade Cobalt ore, was made some eight or ten weeks ago. The Evans is a cleanly handled, well-equipped mine. It is distinctly encouraging that on the Edison Mine, in the same district, a six-inch cobalt silver vein has been discovered. The Portage Bay district is now put on a more promising footing.

The stamp mill on the McKinley-Darragh is running. Ore from the dump is being crushed. This is the first ore reduction plant to be put in commission in Cobalt.

The Cobalt Lake Mining Company is soon to ship three or four cars of ore. Superintendent Fralick has sunk No. 4 shaft to a depth of 110 feet, and drifting at the 85-foot level is progressing. When the shaft has attained the depth of 150 feet drifting will be commenced under the lake. The possibilities of drifting at the 85-foot level are limited. At that depth a drift would cut into the lake if continued too far.

Night Hawk Lake is situated about 90 miles, as the crow flies, north of Cobalt. But a much longer distance must be travelled before the prospector who leaves Cobalt with the lake as his objective point, reaches his destination. Night Hawk Lake is at the head waters of Frederickhouse River, which joins the Abitibi to the north. It is reached from MacDougall's Chute on the T. & N. O. Railway (about 100 miles north of Cobalt). A short paddle on Black River (a tributary of the Abitibi) until the Abitibi is reached. Ten miles down the Abitibi, at Iroquois Falls, a landing is made. After Bartlett's Camp (six miles on a wagon road) is reached, a portage of over a mile is taken to Wilson Creek, then Frederickhouse River is entered, Frederickhouse Lake, and at last Night Hawk Lake. Night Hawk is about 13 miles long and seven miles in width.

On Saturday, 31st August, the new compressor on the Right of Way was started. The new hoist has been shipped and Supt. Houston will soon have his full complement of men at work.

The "Rothschilds" Mine has been closed down. On the Rochester, which it adjoins, good finds have been made recently. Three shafts have been sunk to a depth of about forty feet each on the Rothschilds, but all the work has been carried on without much system.

La Rose shaft is now down 340 feet. On the three levels about 1,800 feet of drifting has been done. Most of this is on

the first level. Fully 1,000 feet of cross cutting also has been performed. The old La Rose shaft on J. B. 4 is to be made the main shaft. Work has been started on it.

The Foster Mine shipped a carload of cobalt ore to Swansea, South Wales, and one of No. 1 ore to the Copper Cliff Smelter, about August 21st.

The reported finds of gold at Night Hawk Lake are attracting many prospectors. Two Swedes are said to have found a ledge.

SAULT STE. MARIE.—After operating for two years without cessation, the plant of the Algoma Steel Company was closed down on August 21st. The rail mill, the capacity of which is 500 tons per day, is in need of repairs, and blast furnace No. 1 is to be relieved. Operations will be resumed early in September.

The Helen Mine, which has in its short life shipped over one and one-half million tons of high grade iron ore, will this summer increase its shipments by about 50,000 tons. The plant of this mine, which was last year destroyed by fire, has been replaced by very modern equipment and buildings. Mr. Seelye, the efficient superintendent, has worked the mine with a high degree of sound economy.

The newly organized Canadian Smelting and Refining Company hopes to have its new smelter completed within six months. It is announced that Otto Stalmann, of Salt Lake City, is to be general manager. The plant is to have a capacity of 125 tons of ore, and will treat Cobalt and other ores. It is doubtful if construction can be completed as rapidly as the directors hope.

GENERAL MINING NEWS

BRITISH COLUMBIA.

Victoria.—Mr. Tolmie, Deputy Minister of Mines, left Victoria on August 23rd for the Kootenay district. Mr. Tolmie is to report to the Executive Council upon the present situation and the future outlook of the coke supply. The Government is prepared to act decisively in this direction.

Kamloops.—Mica, of good quality, has been discovered near Tete Jaune Cache, Cariboo. Mica has already been mined in the district.

Cranbrook.—The Payroll mine has begun shipping its rich telluride gold over to Trail.

Ashcroft.—The Slocan-Cariboo Mining & Development Company, operating on Canadian Creek, has suspended work for the season on account of difficulties with water in the shaft.

Princeton.—Coking coal has been found on the north fork of Granite Creek, four miles from the town of Granite Creek. A 200 foot tunnel has been driven.

Nicola.—The Nicola Coal & Coke Company, whose workings are on the Coldwater, are shipping coal steadily. Developments promise a much increased output before the end of the year.

The Diamond Vale Coal & Iron Company are sinking a second shaft. They will soon become producers.

Mount Sicker.—The Tyee Copper Company is conducting diamond drill prospecting on the 500 foot level of the X. L. Mine.

The Lenora Mine is storing ore in bunkers. Shipments will be made when the railroad work is finished.

Coast District.—The Britannia Mine, situated on Howe Sound, and connected with the shore by an aerial tramway 3 1-2 miles in length, has struck a large chute of payable copper ore on the new Jane tunnel. The mine is located on Britannia Mountain, 3,500 feet above sea level. The plant is entirely operated by water power.

Atlin.—The Atlin Consolidated Mining Company is handling a large amount of gravel by means of steam shovels. The company reports good clean-ups for the summer. The North Columbia Gold Mining Company is enlarging its hydraulicking outfit.

Slocan District.—The American Boy Mine, last year a considerable shipper of lead and zinc ore, has been leased to J. P. McGuigan for eighteen months.

The Hewitt Mine, including a group of claims covering about 400 acres, on Four Mile Creek, three miles from Silverton, has been acquired by Olcott Payne and a syndicate of his associates. The price is reported to have been $250,000, of which $75,000 was cash. Approximately 9,00 feet of development has been done, including a series of tunnels, which open the mine to the 700 foot level.

Fernie.—The Crow's Nest Pass Coal Company is laying out a townsite at Michel. The company has announced that it will sell the lots cheap to bona fide miners, in order of application, and employes of the company. The agreement will require the man to whom the lot is sold to build a dwelling house on the lot within a reasonable time. An important part of the agreement also is a clause prohibiting the sale of liquor upon the premises.

Rossland.—To put a stop to the exportation of coke, the advisability of an imposition of an export duty is being seriously discussed. Advocates of this measure recommend a duty of $2.50 per ton. This would certainly keep British Columbia's coke output within the Province's borders and would tend largely to relieve the shortage.

Boundary.—Ten stamps are dropping at the Cariboo-McKinney mill. Ten more are under repairs now and will very soon be dropping.

ALBERTA.

Lethbridge.—The Diamond Coal Company, whose collieries are situated on the north bank of the Belly River, six miles from Lethbridge, owns 1,924 acres of surface rights, 5,134 acres of mining rights and a townsite comprising 320 acres. The bankhead, power houses, etc., are now under construction. The main tunnel of the workings is now over 1,000 feet in length. A small quantity of coal has already been mined and marketed.

YUKON.

Dawson.—The Guggenheims are installing three dredges on Humble Creek. Among the Hunker mills, the Temperance, Delhi, Whisky, Nugget, Australian and some others are not included in the Guggenheims' concession.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

On August 10th the Conciliation Board for South Wales and Monmouthshire granted the miners an advance in wages of 5 per cent. Three months ago, Lord St. Aldwyr awarded an advance of 11 1-4 per cent. The wages rate now stands only 2 1-2 per cent. below the maximum. Other advances of wages have been conceded in coal mining districts.

In the month of May of the current year the copper smelters of the Urals produced 663 tons of copper.

Important new discoveries of platinum have been made in the Northern Urals, on the Koiva river.

AFRICA.

Mr. Walton gave notice in the Cape House of Assembly on August 19th that he would move for the imposition of a profit tax of 10 per cent. on diamond and copper mining companies earning over £50,000 per annum.

MEXICO.

Electric power is to be transmitted from Guadalajara to Etzatlan and Hostolipaquillo districts. The price fixed is about $100 per horse-power per annum.

STATISTICS AND RETURNS

British Columbia copper ore shipments for week ending August 24th:—

Boundary Shipments:—Week, 22,415; year, 761,798.

Rossland Shipments:—Week, 5,313; year, 173,872.

Slocan-Kootenay Shipments:—Week, 3,007; year, 85,193.

The total shipments from the mines in the above districts for the past week were 30,738 tons and for the year to date 1,020,863 tons.

Following are the figures of copper ore output of the Boundary, B.C., district, for July, 1907:—

From Granby mines	80,216
From Mother Lode	21,040
From Emma	350
Oro Denoro	4,556
From Brooklyn	6,799
From Rawhide	9,421
From Idaho	1,913
From Sunset	5,153
From Mountain Rose	514
From Snowshoe	20,840
From Providence	30
From Skylark	20
From Sally	25
Total for July	150,873

CROW'S NEST COAL.

The output of the collieries for the week ending August 23rd was 19,199 tons; daily average, 3,200 tons.

COBALT ORE SHIPMENTS.

The ore shipments for the week ended August 24 totalled 315 1-4 tons. It is understood that one of the Coniagas cars was of high grade ore, but that they are withholding shipments until the new smelter gets running. The shipments in detail were: Nipissing, 126 tons; Coniagas, 61 1-4 tons; Townsite, 33 tons; Foster, 33 tons; Kerr Lake, 32 tons; Buffalo, 32 tons.

DOMINION COAL COMPANY.

Outputs, August, 1906, and 1907:—

	Tons. 1907, approx.	Tons. 1906, actual.
1	44,670	45,825
2	58,610	54,741
3	32,910	38,464
4	43,100	50,886
5	60,700	54,977
6	19,830	9,933
7	.....	11,891
8	21,380	24,566
9	27,700	35,959
10	7,730	4,274
	316,630	331,716
Shipments	371,982	343,789

COBALT ORE STATEMENTS, WEEK ENDING AUG 31ST.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

Buffalo—Week ending Aug. 31, ore in pounds, 100,000; since Jan. 1, ore in pounds, 1,618,830.

Coniagas—Week ending Aug. 31, ore in pounds, 160,500; since Jan. 1, ore in pounds, 4,368,820.

Kerr Lake (Jacobs)—Week ending Aug. 31, ore in pounds, 61,000; since Jan. 1, ore in pounds, 373,780.

Nipissing—Week ending Aug. 31, ore in pounds, 65,140; since Jan. 1, ore in pound, 3.764,441.

Trethewey—Week ending Aug. 31, ore in pounds, 65,000; since Jan. 1, ore in pounds, 1,411,018.

The total shipments for the week were 451,640 pounds, or 225 tons.

The total shipments since Jan. 1, 1907, are now 17,016,460 pounds, or 8,508 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2,144 tons, valued at $1,473,196; in 1906, 5,129 tons, valued at $3,900,000.

The total shipments for the month of August amounted to 1,237 1-2 tons, or about 34 tons less than in July. There were thirteen shippers, the leaders being the Nipissing, with 468 1-2 tons, Buffalo next with 180 tons, and Coniagas third with 123 3-4 tons. Shipments in detail were:—La Rose, 2 cars, 42 3-4 tons; Nipissing, 16 cars, 468 1-4 tons; Nova Scotia, 1 car, 33 tons; O'Brien, 1 car, 30 1-2 tons; Drummond, 1 car, 21 1-4 tons; Buffalo, 6 cars, 180 tons; Silver Queen, 3 cars, 88 tons; Coniagas, 4 cars, 123 3-4 tons; Kerr Lake, 2 cars, 62 1-2 tons; Trethewey, 1 car, 32 1-2 tons; Foster, 2 cars, 62 tons; Townsite, 1 car, 33 tons; total, 1,237 1-2 tons.

Cobalt's shippers for the first eight months of 1907 have been:

	Tons.
Coniagas	2276.34
Nipissing	1893.74
O'Brien	1277.46
Buffalo	949.62
Trethewey	680.24
La Rose	405.84
Silver Queen	326.28
Kerr Lake (Jacobs)	187.60
Foster	158.18
Townsite	101.11
Green-Meehan	98.39
MacKinley-Darragh	94.60
Temiskaming	86.04
Cobalt Central	77.33
Right-of-Way	65.55
Temiskaming Cobalt	59.91
Temiskaming & Hudsoy Bay	49.67
Nova Scotia	48.00
Colonial	40.28
University	30.69
Drummond (is storing its ore)	22.00
Silver Leaf	21.76
Red Rock	20.00
Imperial (Evans)	18.96
Total output for 1907 (8 months)	9989.59

or an average monthly output of 1118 tons.

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp:—

Buffalo—Week ending Aug. 24, ore in pounds, 60,000; since Jan. 1, ore in pounds, 1,518,830.

Coniagas—Week ending Aug. 24, ore in pounds, 128,140; since Jan. 1, ore in pounds, 4,208,320.

Foster—Week ending Aug. 24, ore in pounds, 64,000; since Jan. 1, ore in pounds, 256,350.

Kerr Lake (Jacobs)—Week ending Aug. 24, ore in pounds, 63,780; since Jan. 1, ore in pounds, 312,780.

Nipissing—Week ending Aug. 24, ore in pounds, 247,055; since Jan. 1, ore in pounds, 369,301.

Townsite—Week ending Aug. 24, ore in pounds, 66,000; since Jan. 1, ore in pounds, 150,078.

The total shipments for the week were 628,975 pounds, or 314 tons.

The following are the figures of German consumption of foreign copper for the months January-July, 1907:—

	Tons.
Imports of copper	73,732
Exports of copper	4,969
Consumption	68,763

as against consumption during the same period in 1906 of 68,659 tons.

Of this quantity 57,532 tons were imported from the United States.

New Dividends

The directors of the Granby Consolidated Mining & Smelting Company have declared the regular quarterly dividend of 2 per cent. and 1 per cent. extra, payable Sept. 30th. Books close Sept. 13th and re-open October 1st.

METAL, ORE AND MINERAL MARKET.

Aluminum, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—8 1-2 to 11 cents per lb.
Arsenic, white—7 1-2 to 7 3-4 cents per lb.
Barytes, crude—$11.25 to $14.75 per short ton.
Bismuth, metal—$1.50 to $1.75 per lb.
Cadmium, metal—$1.30 to $1.35 per lb.
Carbons for drills—$75 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b., Cobalt, Ont., unrefined—25 to 40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$15 to $30 per ton.
Lead—5.25 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$50 to $80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 90 per cent. pure—$4.50 to $5.00 per unit.
Nickel, metal—45 to 65 cents per lb.
Platinum, scrap—$21.50 to $22.50 per ounce.
Pyrite—38 to 45 per cent. sulphur, lump ore, 10 1-4 to 11 1-2 cents per unit.
Quicksilver—$40 to $41 per 75 lb. flask.
Sulphur—$23 per long ton.
Talc—$18 to $25.00 per ton.
Tungsten, pure metal—$1.28 per lb.
Tungsten ore, 60 per cent. pure—$9 per unit.
Tin—37 cents per lb.

MARKET NOTES.

Spelter.—Light demands still continue. Prices are falling. New York, 5.45 cents per lb.; London, £21 7s. 6d. per long ton.

Lead.—Market fixed. New York, 5.25 cents per lb.; London, £19 10s. for Spanish lead.

Tin.—Market shows steadiness and upward tendency. New York, 37 cents per lb.; London, £168 5s. for spot.

Copper.—The official price of copper has been reduced to 18 cents. Some transactions are closed at even lower price. New York, electrolytic, 17 1-2 cents per lb.; lake, 18 1-8 cents per lb.; London, £74 10s for spot standard.

Silver.—Aug. 15, 69 1-8; Aug. 16, 69 1-8; Aug. 17, 68 7-8; Aug. 19, 68 5-8; Aug. 20, 68 1-8; Aug. 21, 68 3-8; Aug. 22, 67 7-8; Aug. 23, 67 3-4; Aug. 24, 68 1-4; Aug. 26, 68 1-4; Aug. 27, 68 3-8; Aug. 28, 68; Aug. 29, 67 7-8; Aug. 30, 68 1-4; Aug. 31, 68 3-8; Sept. 3, 68 3-8; Sept. 4, 68 1-4.

Mexican dollars, 52 1-2 cents. Sterling exchange $4.862.

Pig Iron.—Pittsburg—Bessemer pig, $22.90; No. 2 foundry, $22.25.

Iron Ore.—Bessemer, old range, $5; Bessemer, Mesabi, $4.75; non-Bessemer, old range, $4.30; silicious, non-Bessemer, $2.50.

Quicksilver—$40 to $41 per 75 lb. flask.

THE MINERAL ROD.

A curious survival is the "Mineral Rod." There are still extant "practitioners" of the art of discovering mineral deposits by means of the bifurcated rod. Their methods are various and peculiar. The "diviner" usually claims to have some compound of virtue so signal that by its aid he can detect the presence of the precious metal under any conditions. Several of the older school assert that the delicacy of the rod permits of their differentiating as to the character of the mineral lode. These men, more often than not, are firm believers in their own ability to carry out their boasts. Hardly can they be convinced by failure and never can they be enlighted by argument.

Many years ago, a mineral rod man in an Eastern Province of Canada was put to the test. The manager of a gold mine questioned him concerning his powers, and asked him specifically if he could detect the presence of gold in quantity within the mine office. The diviner assured the manager that there was no limit to his powers. Thereupon the manager stumbled against a chest from which came a metallic jingle. The noise and the apparent confusion of the manager convinced the "rod" man that gold was hidden in the chest. He therefore seized his rod, which immediately responded to a powerful current of influence from the chest. Bit by bit, as the diviner circled the room the attraction of the chest became more pronounced. At last, with an exclamation of triumph, he declared that the gold was hidden there.

At once the manager opened the chest. Within it was a piece of brick placed in a capacious toilet vessel. The "metallic" sound had emanated from these.—The "diviner" still divines; but he shook the dust of that particular mine from off his feet.

There are many who believe that the phenomena accompanying a mineral rod demonstration are merely the result of the unconscious contraction of certain muscles in the fore-arm of the practitioner. Others think that there is a sub-stratum of virtue in the rod, but that its functions are over-estimated by its followers. However, there is but scant ground to attribute to the rod any virtue beyond that of causing men to dig. Occasionally they dig, at the bidding of the rod, and in spite of it they make a find. This apparently happens often enough to keep the dying belief in a state of flickering life. Sooner or later, like the mammoth, the mineral rod and its believers will have become the shadow of a name.

Always throughout the history of our race men have been searching for short cuts to wealth. Providence, however, has so disposed the hidden wealth of earth that men must work to win it. It is altogether a beneficent dispensation that this is so. Canada in developing her mines will also develop a breed of men, strong, self-reliant, unboastful and competent. Unboastful they will be because men who wrestle with elemental nature learn rapidly the absurdity of loud speech; competent they must become, because our standards of efficiency are every day growing higher and higher. In this process of growth superstition and ignorance will be sloughed as an old and clumsy garment. Mining will be, is now, the vocation of men, of strong men and above all honest men.

WANTED

Mining Graduate (McGill) desires a position in Cobalt or vicinity as Superintendent or Foreman with reliable Mining Company. The applicant has had several years in Montana in the practical work of Mining and Concentrating. At present he is Superintendent of a Mining Company.

Address :—"Montana,"
c/o Canadian Mining Journal.

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Prospectors and others wishing to dispose of Mining Claims or undeveloped Mines in Ontario or Quebec, can communicate full particulars to the address below.

The properties will be examined by competent mining engineers, and if satisfactory, arrangements will be made to buy the same.

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Particulars P.O. Box 512, Fort William, Ont.

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A valuable property of Iron Pyrites in the Township of Madoc, about 1½ miles from the Bay of Quinte Railway. Two veins 11½ feet wide and 6 feet wide respectively of high grade pyrites, averaging 52 per cent. sulphur. Mining cheap. Veins have well defined walls. Mine is on side of high hill.

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One Class D Rand Cross Compound Condensing Duplex Air Compressor having a capacity of 835 feet of free air and will run 10 No. 2 Rand Drills. High pressure steam 14 x 24, low 22 x 24, air cylinders each 14 x 22. Has Myers' patent steam cut off valves and machanically operated air valves. Machine good as new.

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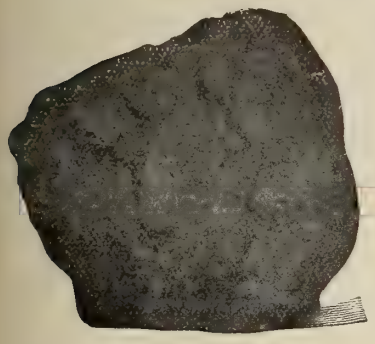
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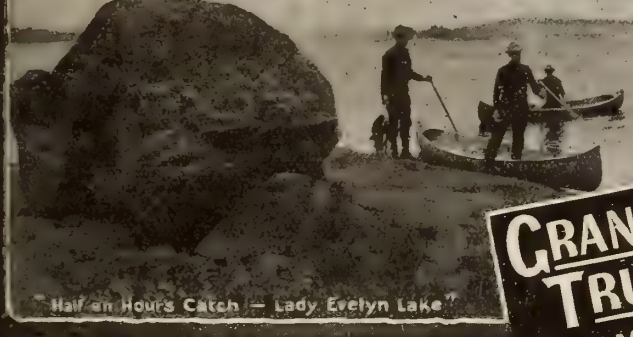
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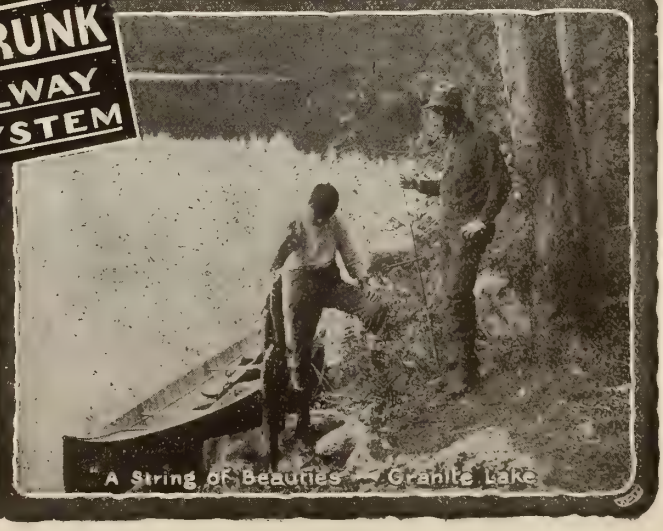
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The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

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Announcement

THE publishers of THE CANADIAN MINING JOURNAL are presently to issue a Souvenir Handbook commemorating the recent visit of the American Institute of Mining Engineers to Ontario. This Handbook will be in every way a complete and appropriate memento of an important event. The cover has been specially designed. The text will embody a synopsis of the proceedings and expressed opinions of the eminent visitors, and historical and descriptive sketches of the mining districts visited. Many half-tones and maps will embellish the reading matter.

The Handbook will appear during September. As the edition will be limited, orders should be placed at once. The price is One Dollar.

THE CANADIAN MINING JOURNAL

VOL. I. No. 14 New Series | TORONTO and MONTREAL | Old Series, Volume xxviii. No. 16

The Ontario Companies Act

provides that the purchaser of stock in mining companies be supplied with a prospectus giving specific information on these points:—

(1) The names and addresses of the vendors of the property purchased or acquired by the company.

(2) The amount paid or payable as purchase money in cash, shares or debentures of any such property, specifying the amount payable for good-will.

(3) The amount paid or payable as commissions.

(4) The amount of preliminary expenses.

(5) The amount paid or intended to be paid in cash, shares, or debentures to any promoter, and the consideration for any such payment.

(6) The dates of and parties to every material contract, and the place where such contract may be inspected.

(7) Full particulars of the nature and extent of the interest of every director, with a statement of all sums paid or agreed to be paid to him in cash or shares by any person either to qualify him as a director or otherwise for services rendered by him.

The Act further provides for the imposition of a penalty of $200 for each violation of the Act, and state that *where the prospectus contains any mis-statement of fact every director is personally liable for the full amount of moneys paid by shareholders, together with interest on the same and damages.*

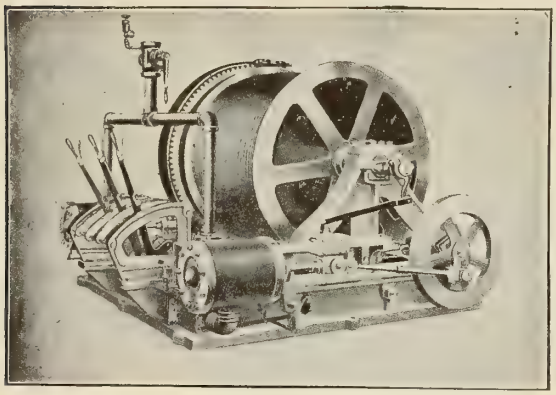
Pages of Special Interest

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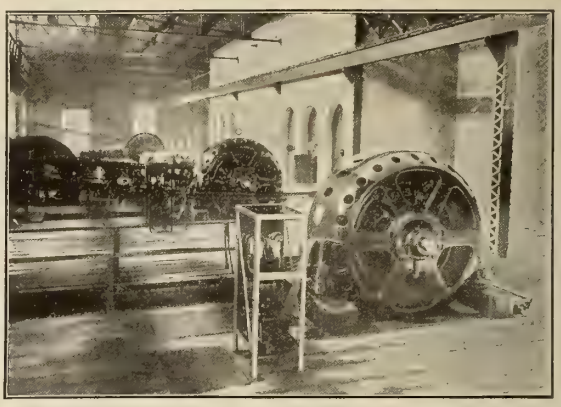
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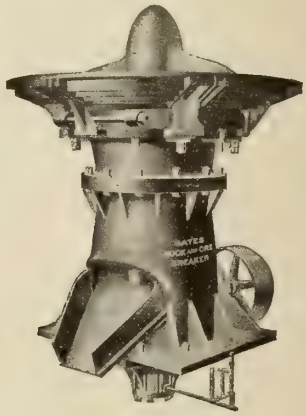
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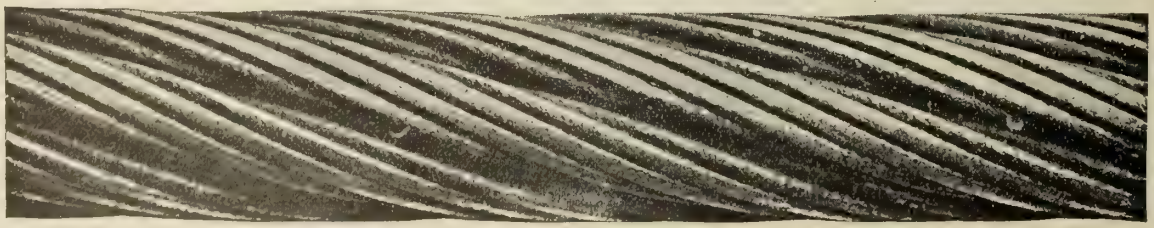


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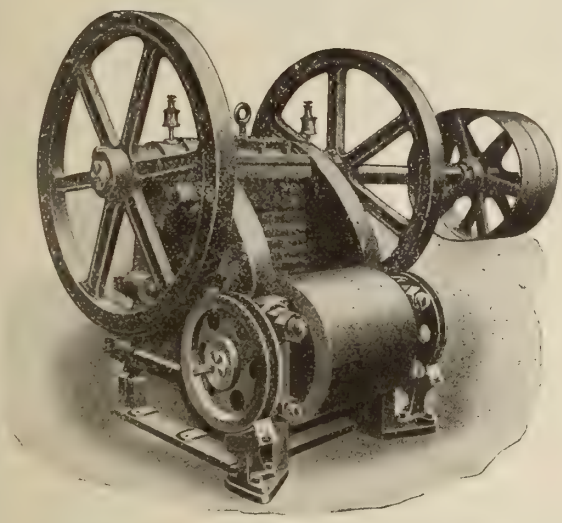
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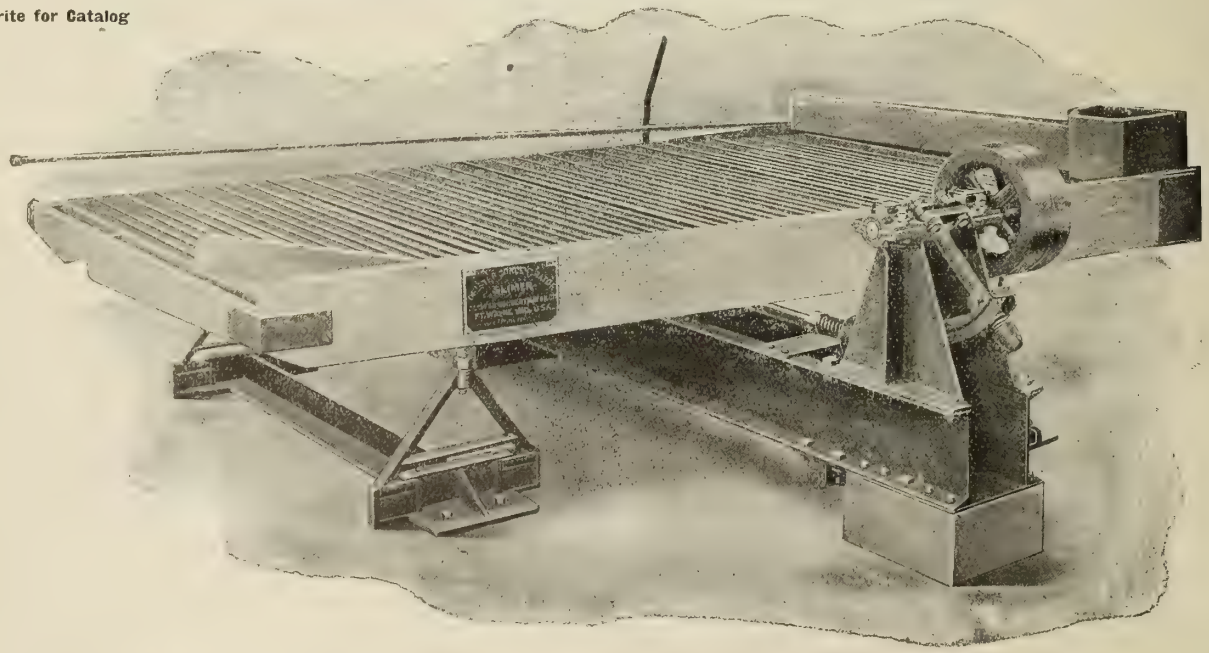
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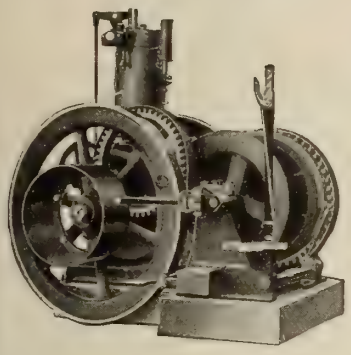
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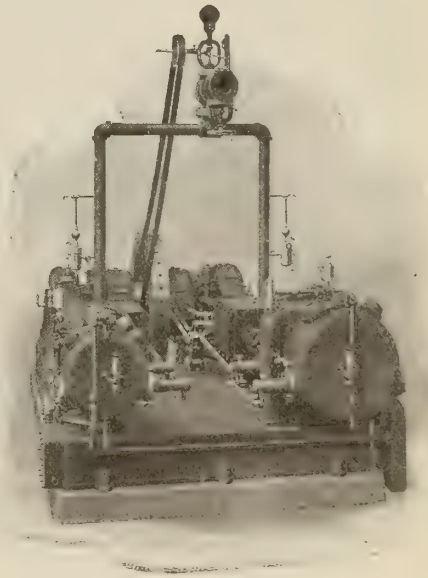
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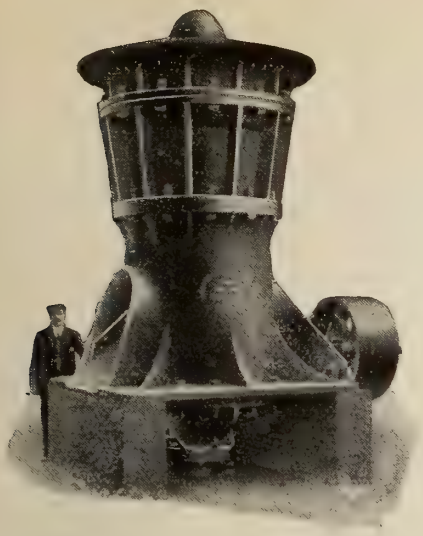
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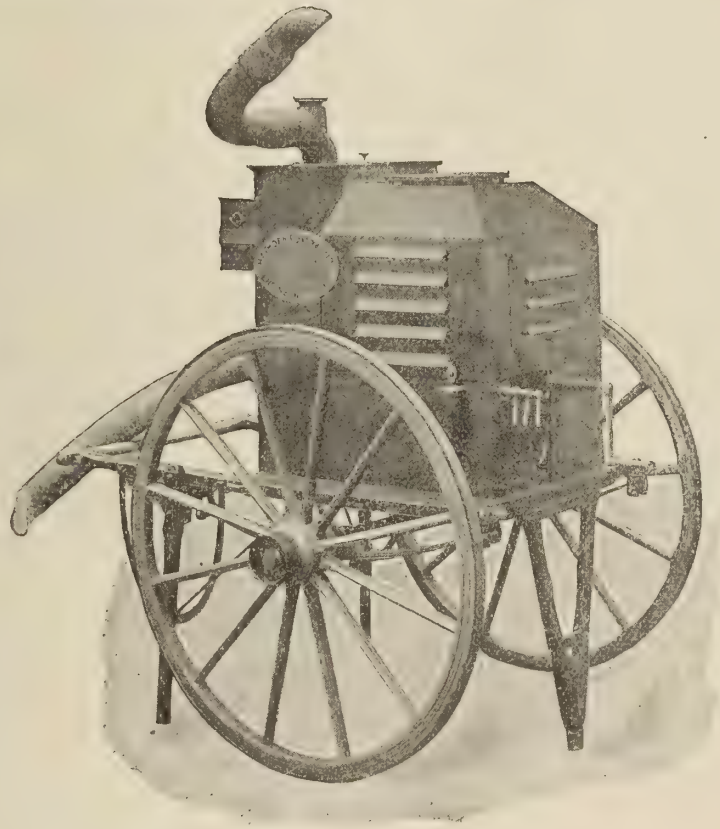
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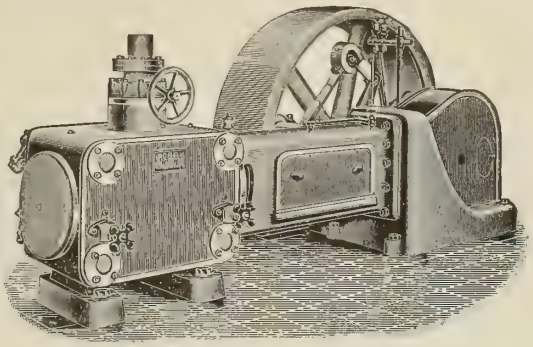
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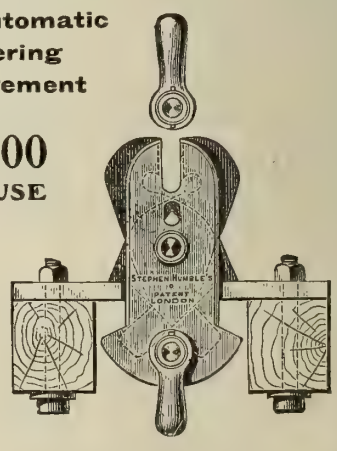
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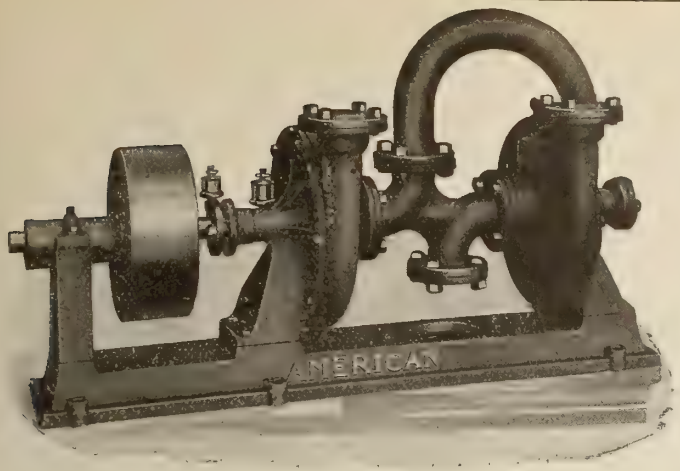


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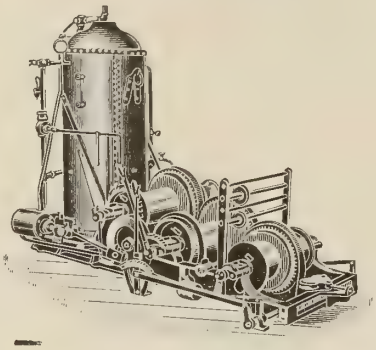
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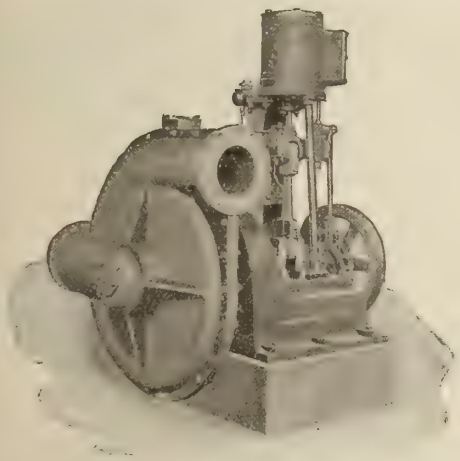
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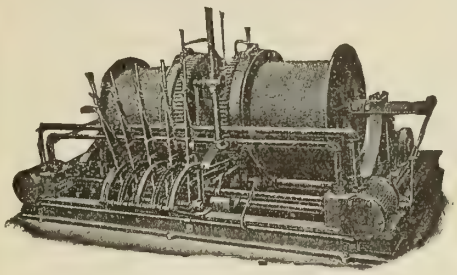
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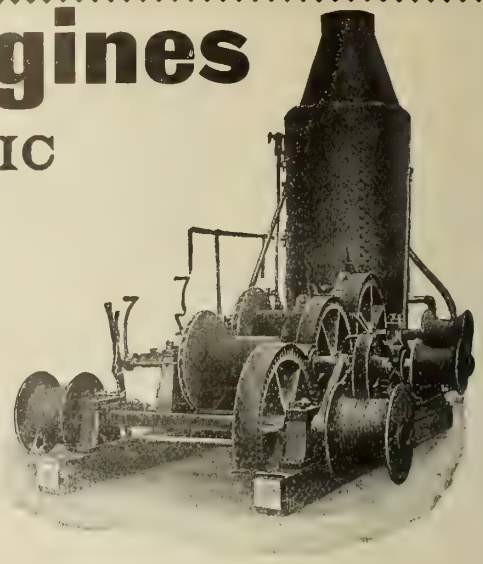
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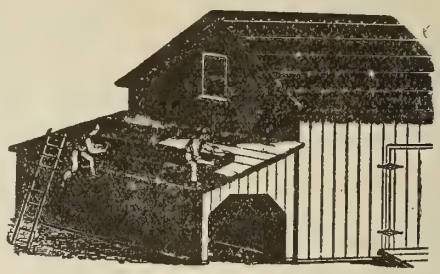
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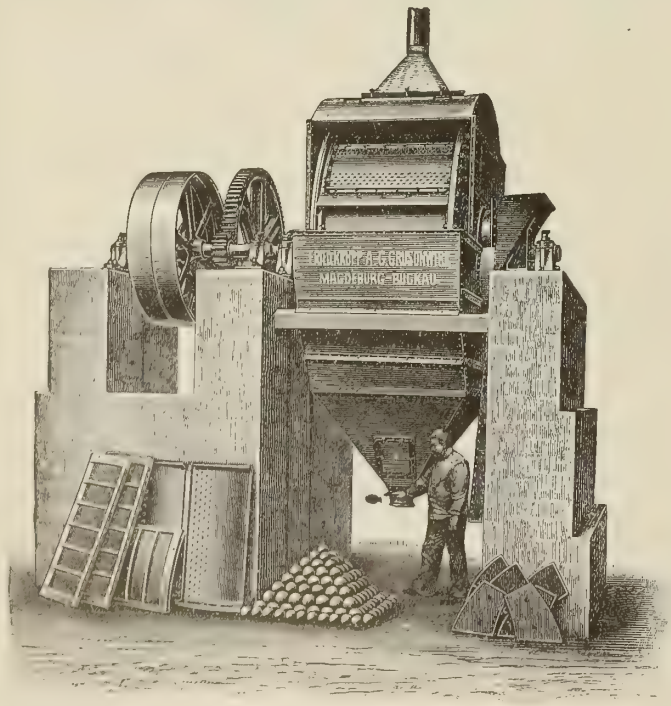
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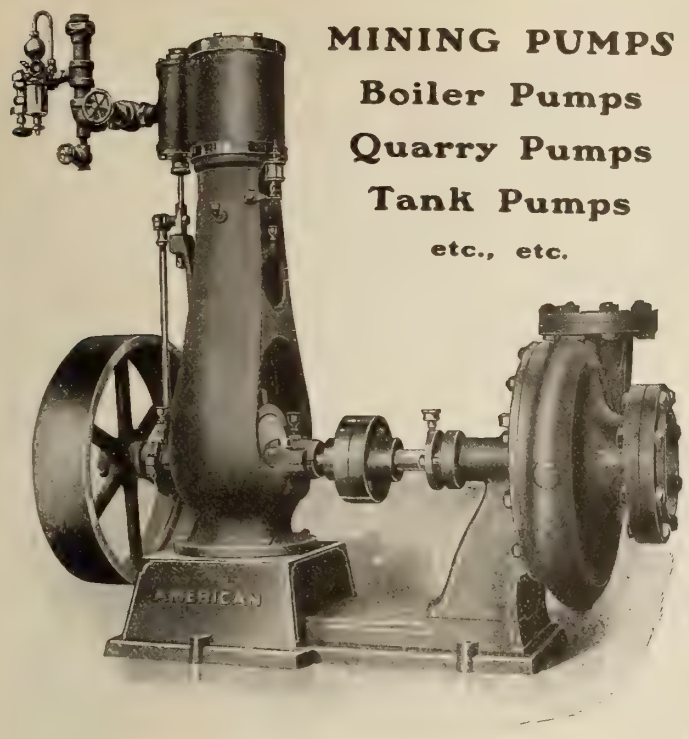
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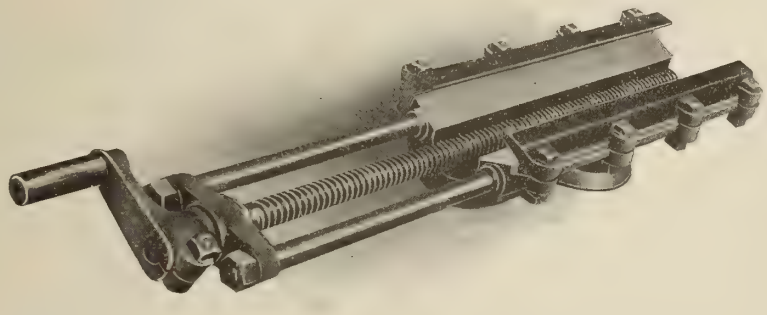
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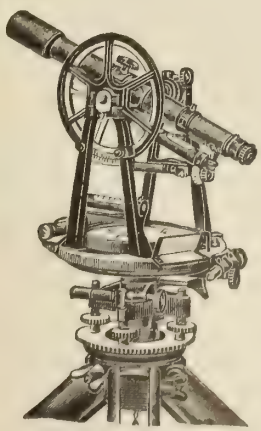
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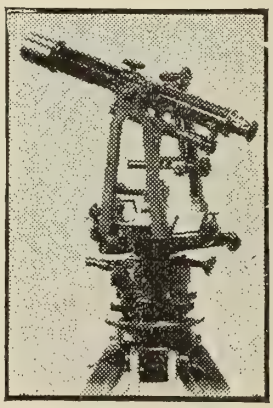
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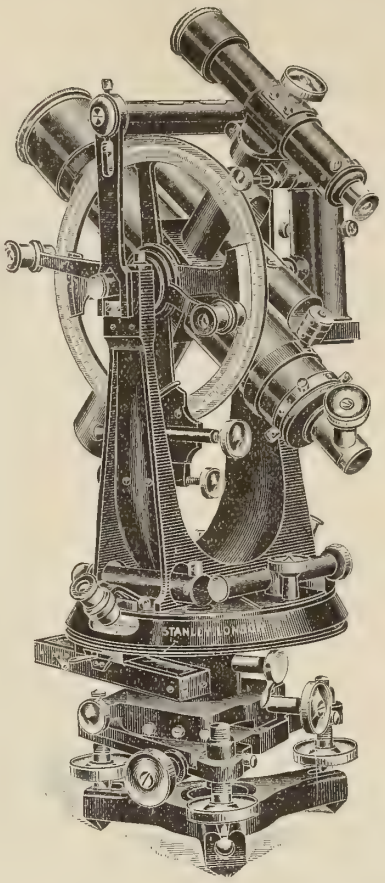
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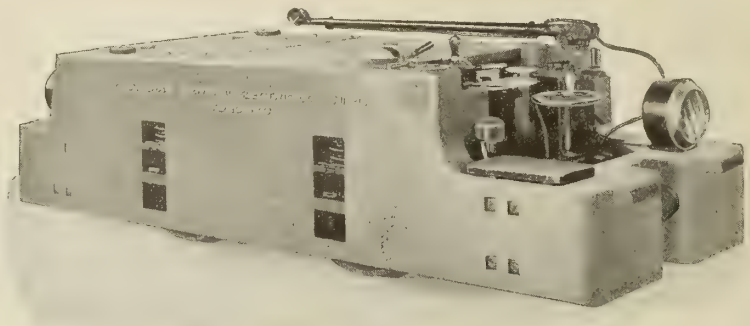
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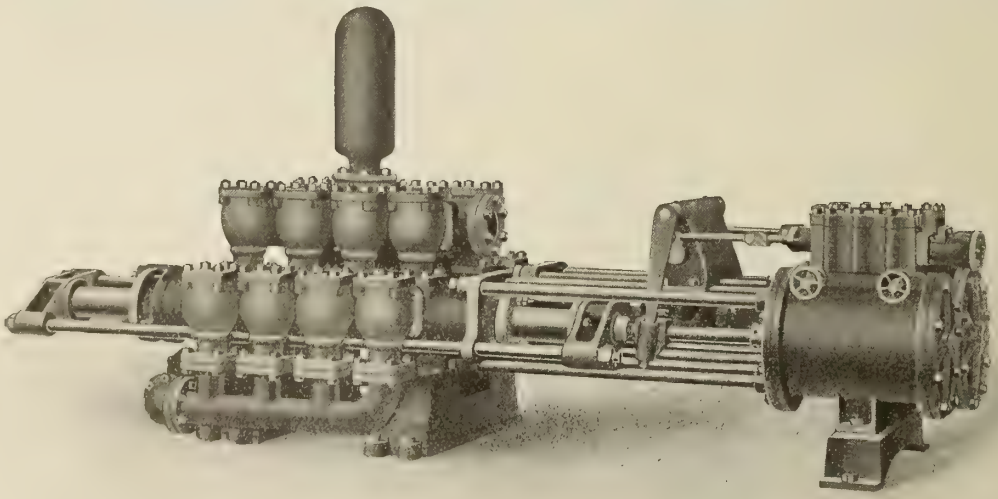
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VOL. I, No. 14, New Series TORONTO and MONTREAL, October 1, 1907 Old Series, Volume xxviii, No. 16

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

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MEN AND METHODS

On page 15 of the *Toronto World* of September 14th, 1907, there appears a short article entitled "Larder Lake Investors Making Money—Larder Lake Gold District Proving the Greatest in the World." It begins by stating that eminent engineers from England, Germany and France have recently made "searching examinations of the Larder Lake gold fields," and that, one and all, they have endorsed the reports of United States and Canadian experts in terming Larder Lake the mining wonder of the world.

The next paragraph implies that "English, German and French engineers," familiar with the great gold deposits of South Africa, Australia and Siberia and the world generally, state that the Larder Lake district outclasses them all.

"One of the most prominent engineers of London," just back from a six weeks' examination of the district, is quoted as stating that South Africa never offered as inviting a field as does Larder Lake.

The fourth paragraph, however, brings us to the significant feature of the article. In vague terms a "report" is repeated, that London engineers have gone to examine the Blue Bell and Lucky Boys' mines, that well-known mining interests of England and France are to become "strongly identified therein," and that a great smelting plant is to be erected. "The price at which these interests" (we quote the *World's* phrases here unchanged) "will become interested is reported to be considerably above par and is not from private holding, but from the treasury stock of the companies." Reference is then made to the fact that Law & Company, brokers, of Toronto, during the past six months placed the shares of the Lucky Boys and Blue Bell mines on the market at 6 and 10 cents respectively. The development of many veins "running in width from 4 feet to 140 feet" is mentioned, and the value of the ore in sight and available for the two companies is estimated at more than thirty millions of dollars.

The "outcome" of all this is taken as vindicating the judgment of the brokers mentioned above. The article concludes with the statement that engineers and miners who have examined and are familiar with the properties claim the shares of Blue Bell and Lucky Boys will be worth ten dollars per share within the next year.

Incidentally we shall make a point of remembering that last prediction. If, within a year, shares in Blue Bell and Lucky Boys reach the ten dollar mark, we shall gladly retract all that we intend to say.

There are certain pointed comments called for by this article. In the first place, there are no indications, beyond internal evidence, that it is an advertisement.

Therefore we take it that the *Toronto World* is responsible for its appearance.

Secondly, statements to the effect that Larder Lake gold district is proving the greatest in the world are totally unjustifiable. They are false and they are harmful alike to Larder Lake and to investors. Larder Lake is not "proving the greatest in the world."

Larder Lake is yet and will be for many months a new and unproved camp. The newspaper reports circulated about it have done it vastly more harm than good. Among those competent to express an opinion the district is looked upon as a low grade "proposition" with a possible future before it. The most sanguine of the reputable mining men who have visited the camp do not go farther than expressing their belief that when Larder Lake shakes herself free of wild-cats she will settle down into a steady low grade gold camp.

Therefore nothing could be more fatuously silly than comparing Larder Lake with the established gold camps of Australia and South Africa.

We invite the *Toronto World* or the person or persons who are responsible for the article to give us (in confidence if necessary) the names of the eminent English, German and French engineers who entertain such glowing opinions of Larder. Meanwhile we shall frankly say that we do not believe that any English, French, German, American or Canadian mining engineer of good standing would make any such statements for publication. We are similarly incredulous of the reported statement of "London Engineer," in the third paragraph.

The report that strong English and French interests are to buy stock in the two mines, floated by Law & Company, at considerably above par value, is not given as merely a rumour. It is so placed that the unwary reader will be led to conclude that the deal is about to be consummated. It will therefore require our attention for a moment.

It is very unusual, to put it mildly, for mining engineers commissioned by "well-known mining interests" to advertise their intentions or to allow them to be advertised. The *Toronto World*, after saying that "engineers have gone to examine" the mines in question, implies that, as a foregone conclusion, their report is to be favorable and that English and French capital will be at once injected into the concern. Now this is not only unlikely, but so extremely improbable as to warrant us in calling it fantastic. What decent mining engineers would allow their employers or any one else to take their opinions for granted? If examinations are to be made on these mines by clean engineers, then neither the *Toronto World* nor THE CANADIAN MINING JOURNAL can have any legitimate means of knowing what their dictum is to be. As it stands then, this portion of the paragraph is unworthy of credence. It follows logically that the statements based upon this rumour, concerning the acquisition of the stock, fall into the same category. It also follows that, contrary to the *Toronto World's* opinion, the whole business reflects no credit upon Law & Company, brokers, of Toronto, Ontario.

The *Toronto World* is oftentimes the outspoken and fearless champion of right. The publication in its columns of trashy mining advertisements and of inspired mining news can add nothing to the paper's reputation. This applies, in varying degrees, to almost every newspaper in Toronto. We wish for the benefit of the Toronto papers, to direct their attention to the principal British Columbia dailies. Their Western contemporaries publish well-authenticated correspondence in mining matters. Their columns are clean and reliable to a very commendable extent.

THE PASSING OF THE SCOTT ACT

(Contributed)

In the County of Cape Breton at the present moment the average man "dunno where 'e are" in the matter of liquor laws, and in Glace Bay at least there is "no King in Israel." The fourteenth was pay day, and at night the streets of the town were full of "drunks." The local paper states that the sounds of revelry and blasphemy continued till three in the morning of Sunday. It was presumed that Saturday was the last day of the Scott Act, but the lawyers are not yet quite sure whether the Scott Act is in existence or not, as its repeal has not been gazetted. Samuel Weller said the law was a "hass." He was right. We imagine that the smaller fry amongst the legal fraternity will deplore the passing of the Scott Act into the limbo of things that have been, for it was the cause of much profitable litigation. Peace to its ashes, and may it never be resurrected until our councillors are men of more wisdom than those who represent us to-day. It is stated that under the Provincial License Law no license application can be entertained until December, and no license can be granted until March, 1908, and that further, any person convicted of selling liquor forfeits his right to apply for a license for the space of four years. Hence we are told that for six months we shall get real prohibition. Shall we? The Scott Act was not carried out, and the Nova Scotia License Act will not be carried out. So long as liquor is manufactured in Halifax and Upper Canada it will be drunk in Cape Breton, and the tighter the bands of prohibition are drawn the viler will be the stuff dispensed, and the more flagrant will be the evils of secret drinking in the unmentionable dives that such sumptuary laws encourage. The Mayor of Sydney in a recent speech said "one might as well try to enforce the Ten Commandments, as try to enforce prohibition." Such a remark is not orthodox and its morality is doubtful, but alas, men in general are neither orthodox nor moral, indeed we have it on good authority that men are "deceitful and desperately wicked." The utterly impossible and hopeless attitude of the extreme temperance party on this subject is well illustrated by a remark that was made to the

writer when discussing this matter with a gentleman who is fairly representative of his class. This gentleman said: "If I thought that the granting of a restricted number of licenses in Sydney would cut down the drinking by fifty per cent. I would not append my name to an application, simply because I object to the principle." We had thought it was the drinking these gentlemen objected to.

We again submit that the only cure for the drink evil lies in a gradual education of public opinion along temperance lines, and the provision of suitable and cheerful places where light beers and refreshments are dispensed and where men can read and indulge in various games of skill and recreation. Good work has been done along these lines under the auspices of our Governor-General, Earl Grey, in the large cities of England. Workingmen, and particularly miners, must have occasional amusement and relaxation, and if it is not provided for them elsewhere they will find it in the saloon. Temperance bodies may debate, legislatures may legislate, and preachers may fulminate until the crack of doom, but nevertheless, the workingman will have his beer, willy nilly. Then why not appreciate this fact, and give it to him of good quality and openly, and amid congenial surroundings. For when all is said and done have it he will.

REWARDING PROSPECTORS

An excellent point is made by a correspondent in this number of The Canadian Mining Journal. He brings forward the suggestion that prospectors should be rewarded by the State. Not only should the successful prospector share in the beneficial results of his ardour and perseverance; but the unsuccessful should receive some recognition. Not always are the prospectors who make the biggest stake the men who have done most for the opening up of the country. It is not unusual to find the boldest and sturdiest pioneers quite dependent upon small tradesmen for their grubstake. If, in process of time they make no remunerative discoveries, this precarious means of support is cut off and the knights of the wilderness find themselves stranded on the high and dry shore of destitution.

Assuredly no better use could be found for a moiety of the wealth that the country derives from her mineral deposits than that of providing for the old age of prospectors.

STEEL VERSUS COAL

Judge Longley's decision in favor of the Dominion Steel Company was in some respects a surprise. While it was apparent to those who carefully watched the progress of the suit that the Dominion Steel Company would get at least a favorable decision, it was hardly expected that every contention put forward by the Dominion Coal Company would be brushed aside. In the interests of lasting peace it is probable that a less sweeping decision would have been better. If the Dominion Coal Company needed any incentive to continue the fight, that incentive has been given it now. Apparently an appeal on the part of the Coal Company is certain.

When one considers that an English expert was retained by the Dominion Steel Company to give evidence, that he was paid at the rate of $250 per day outside of his expenses, and when one further reflects that this is but a small item in the total expenditure of one of the litigants, the conclusion obtrudes itself that neither company has the moral right to waste its substance in such riotous foolishness.

A summary of the principal points of Judge Langley's decision will be found on another page.

MINE TAXATION

Arizona is enforcing a mines taxation law, the provisions of which will probably surprise Canadian mine owners. The basis for evaluation of mining property is taken as 25 per cent. of the gross metal output of productive patented and unpatented mines, and $20 per acre for non-producing mining claims. Under this system of assessment the larger mining companies have a well-proportioned share of the tax. The relatively heaviest tax, however, falls upon non-producing mining claims. We note, in passing, that owners of the latter class of claims have done most of the growling.

RESULTS

The Big Ben Cobalt Mines, Limited, has suspended operations. It is to be hoped that the directorate of that company will seize the opportunity of putting themselves in a more favorable light. Had our recent criticisms been unjust we would doubtless have heard from some of the officials. From their silence we draw the conclusion that they cannot gainsay the facts adduced. Hence we fully expect to hear of a thorough re-organization of the company or of the refunding of the moneys sent in by purchasers of the stock. It is hardly necessary yet to remind investors that they can easily recover their subscriptions by availing themselves of the Ontario Companies' Act.

Editorial Notes

A German correspondent enquires for Canadian shippers of agate. Quotations on any quantities that can be supplied at market figures c.i.f. Hamburg, Marseilles and Trieste. The Canadian Mining Journal will gladly give further information to any one interested.

Canada's pre-eminence over the United States in the production of mica is encouraging. Statistics given on another page demonstrate that Canadian exports of mica exceed the total production of the United States by over 100 per cent. The regularity and extent of Canadian mica deposits, and the high grade of the mineral found, should be ample guarantees that the relative positions of these two countries will be maintained.

A LARDER LAKE WILD CAT

We have before us what purports to be the prospectus of "The Blue Bell Gold Mines, Limited," issued by Law & Company, stock brokers, Traders Bank Building, Toronto, Ontario.

In this document there are four pages. The first page begins with a caption in heavy letters, "Larder Lake the New Eldorado of Northern Ontario." Next comes the column title, "The Golden North and the Golden Opportunity." This is succeeded by almost two columns of lyrical prose, interstrewn with exclamation marks, capitals and other typographical devices. As a specimen of English literature it is wonderfully tawdry; as a sample of the brokers' art it is a nauseating reiteration of exaggerations and falsehoods.

Here we have brokers, making high claims to respectability and reliability, offering to the public something for which they wish the public's money in return—in itself a strictly commercial transaction. Instead of telling their prospective customers exactly what they wish to sell them, they engage a printer to put together a collection of adjectives and punctuation marks! After the manner of the patent medicine vendor, this is good work; but as a presentation of facts and figures about a gold mine, it is balderdash.

The phantasm of "ground floor" prices is held out. The imagination and the sentimentality of the reader are appealed to. "Why," the prospectus asks, "should the thousands of strong men who braved the north winds last winter around Larder Lake, etc., etc., etc., have done so unless they knew full well the treasures they were guarding?"

Let us, following Master Socrates, answer this question with another. "Why," we query, "should Law & Company, stock brockers of Toronto, Ontario, devote so much space to claptrap if they have so fabulously rich a mine?" We are persuaded that not ourselves, and very much less Law & Company, would allow the public in on one share of a mine whose ore assayed as high as $15,000 to the ton from "the very grass roots."

In this we may misjudge our friends Law & Company, stock brokers of Toronto. They may be (who knows!) a new type of self-effacing Christians. But in that case we shall consider it our sacred duty to protect them from themselves.

Out of several hundred color effects in words these facts emerge from the first section of the prospectus. Law & Company invite the public to join them and participate in the profits and benefits "that are sure to come to all" who invest in Blue Bell Gold Mines, Limited. The company owns "28 well-selected gold claims." Assays showing $15,000 to the ton have been obtained. The men identified with the project are all that could be desired.

As pointed out in a previous issue, such an assay may mean anything or nothing. In Larder Lake it is certain that no large body of ore carrying anything like a fraction of this amount to the ton has yet been discovered. The directors, if respectable mining men they are, have had very little to do with this prospectus.

Page 1 concludes with an extract from the *Toronto World,* April 4th, 1907. The second page also is largely given up to quotations from the *Toronto World* and the "Ontario Mining News." In connection with this free use of extravagant mining news we wish to make some remarks. Enquiry at the *World* office failed to elicit information as to whether such items were paid for as advertisements, were directly inspired by promoters, or were evolved by the paper's reporters. On these points the reader can easily draw his own conclusion—and there is but one conclusion to draw. Here, too, we may insert a warning against two mining brokers' sheets. One for some time known as the *Ontario Mining News,* has recently changed its name to the *Canadian Mining News.* The other appears under the appellation of the *Mining Digest.*

Page 3 presents a map of Larder Lake, on which the 28 forty-acre gold claims of the Blue Bell Company are shown in black. An excerpt from the *Ontario Mining News* contains the usual amount of hyperbole and one gem of phraseology. Quartz is referred to as "these quartz." We mention this trivial circumstance because such things have a deeper significance than is generally known.

Half of page 3 is devoted to three reasons why Blue Bell is a good investment. These reasons are sheer twaddle. What does a business man care about the opinions of old miners about Larder Lake's future?

Why should the fact that thousands of brave men have been frost-bitten in their passionate longing to give Law & Company advertising material, influence the investor?

And, again, more emphatically we protest that directors are not gold mines!

Page 4, except that it is called a "Proclamation," is merely a re-hash of the previous pages. A blank application form appears at the bottom of the page. It is made out to the Trusts & Guarantee Company, Limited, 14 King street west, Toronto.

Not once throughout this prospectus is the capitalization of the company mentioned—an omission which is a most barefaced breach of the requirements of the Ontario Companies' Act. We cannot look upon this as merely an oversight. It is evidently an intentional gap and, just as evidently, Law & Company do not care to give facts and figures. Otherwise why should they offer such a production as this in lieu of the statements demanded by the statutes of the Province?

We shall, in conclusion, enumerate a few of the facts gathered from records in the Provincial Secretary's office. The company was incorporated on April 7th, 1907. Its capitalization is $5,000,000, divided into 5,000,000 shares of $1 each. Its board of directors comprise the followings names:—

President—J. H. Hunter, Cobalt, Ont., capitalist.

Vice-President—D. T. Hughes, Buffalo, N.Y., hotel proprietor.

Secretary-Treasurer—W. A. Abentroth, Toronto, Ont., accountant.

John S. Crawford, Ottawa, Ont., manufacturer.

W. R. Graham, Cobalt, Ont., architect.

The mining claims owned by the company were purchased from William L. Russell for the consideration of 3,000,000 shares of the company's stock. The directors are authorized to pay brokers a commission of 25 per cent. of the stock sold by them. These facts speak volumes for themselves and for the subscriber's chances of getting a run for his money.

Mr. H. Mortimer-Lamb, Secretary of the Canadian Mining Institute, has completed a tour of British Columbia, during which he was successful in adding a considerable number of members to the Institute.

Smelting Works of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, B.C.

J. M. Turnbull.

The smelter of the above named company is located at Trail, British Columbia, on the edge of a flat bench which rises about 200 feet directly above the Columbia River at the junction of Trail Creek.

The smelter began as a small plant producing copper matte from Rossland ores. It was built by F. Augustus Heinze, and was first blown in during February, 1896.

The Canadian Pacific Railway Company acquired it from Heinze in 1898 and greatly enlarged and extended it, lead blast furnaces and refinery being among the additions.



TRAIL SMELTER—FROM ACROSS TRAIL CREEK.

The Consolidated Company purchased it on January 1st, 1906, and have made extensive additions also, including the installation of the Huntington Heberlein process for lead ores, a large addition to the lead refinery, a new copper furnace, enlargement of old copper furnaces and a new sampling mill capable of handling 200 tons per hour.

The total expenditure on plant and equipment to date runs to about $1,250,000.

The Canadian Pacific Railway Company has some three miles of sidings on the smelter flat, and connects the works with Rossland and the other mining camps of British Columbia.

The main features of the equipment consist of the following:—

One 100 ton Fairbanks railway scales.

Five copper blast furnaces. Three of these are 263 x 42 inches at the tuyeres; the others are smaller but will be enlarged to the same size this year. Each of these is capable of handling about 300 tons of Rossland refractory ore per day.

Two lead blast furnaces, 45 inches by 140 inches and 45 inches by 160 inches respectively, at the tuyeres, each capable of handling 125 to 150 tons per day, according to the ores treated.

An extensive system of flues is installed connecting the furnaces with two brick stacks, the highest being 185 feet high.

Two O'Hara roasters, 9 by 95 feet and 12 by 97 feet respectively.

Four Huntington Heberlein circular roasting furnaces, 26 feet in diameter, and twenty-four Huntington Heberlein convertors have replaced the ten hand roasting furnaces formerly in use.

Blowing plant consists of three No. 7, one No. 7 1-2, one No. 8 Connersville blowers; one No. 8, one No. 9, one No. 9 1-2 Root blowers. Each is connected to a separate electric motor, the total power used being some 1,100 horse-power.

Briquetting plant contains two Chisholm, Boyd & White briquette presses, and necessary pugmills, etc.

Old sampling mill for copper ores is equipped with No. 6 Gates crusher, elevator, and series of Vezin samplers and small crushers. Its capacity is 80 tons of ore per hour.

New sampling mill is equipped with No. 8 Gates crusher and Vezin samplers. The capacity is 150 tons per hour, enabling all sampling to be done on one shift, with much resultant economy. Among other improvements in this mill the use of manganese steel is expected to result in a saving in repairs and consequently a saving in time.

The sampling mill for lead and high grade ores has a capacity of 30 tons per hour and is equipped with Blake crushers and Brunton samplers.

made up here and weighed in specially designed side dump cars, which are run to the furnaces by a locomotive, the former system of handling by hand being nearly superseded.

The assay office is a large brick building, and is very completely equipped. It was built in 1902 and is modern in all respects. An electric motor drives the crushers and grinders. Electric heaters are used in the moisture sample dryers and in the chemical laboratories. Four large muffle furnaces are installed and the chemical and other equipment is very complete. A large range of work is done here, including assays and analyses of all kinds of ores, smelter products, coal and coke, and products from the lead refinery.



TRAIL SMELTER REFINERY.

Six Bruckner roasters were installed some years ago, but are not much used at present, not being suitable for use with the products now being turned out in the works.

The haulage system is quite extensive. A large generator with motor is installed in the blower room, and four three ton electric trolley locomotives are used, operating on three levels. The top level runs over the storage yards and distributes ore over the storage yards, which have a capacity of about 40,000 tons of ore. The second level is the main haulage level. It connects with the sampling mills and with a tunnel below the storage yards. Ore, coke, limestone are handled from the yards and sampling mills to the charging bins. The third level is on the charging floor. The charges are

The lead refinery deserves a longer description than can be here given. The equipment consists of three motors totalling 650 kw. and corresponding generators, which supply current at about 80 volts and 3,500 amperes for the electrolyzing tanks. One 50 ton melting pot and anode casting machine, 224 tanks, made of wood and lined with asphalt, each holding 20 anodes. The anodes weigh about 350 pounds apiece. The tank and melting room is 311 by 50 feet, and an electric travelling crane runs the length and handles all materials. Two 50 ton melting pots with pump and casting moulds dispose of the refined lead, which is loaded directly into cars at the door. A patent machine is used for turning out thin cathode starting sheets. The slime plant consists of drying tanks, small reverberatory melting fur-

nace, parting kettles for parting the dore silver bars, tanks for precipitating the silver on copper plates, and an evaporating plant for evaporating the resultant copper solution. A lead pipe machine is part of the equipment, making pipe from 1-8 to 4 inches in diameter, of any length required.

The hydro-fluo-silicic acid required is made in the acid plant, which consists of two distilling furnaces and condensing tower with storage bins for fluor spar and silica.

Handling of material between the furnaces and the refinery, about one-quarter of a mile apart, is done by the yard engine on the tracks of the Canadian Pacific Railway.

The general equipment includes a great amount of smaller plant not mentioned specifically. Complete blacksmith, boiler, machine and carpenter shops attend to construction and repairs, and there are a large number of buildings, including general offices, warehouse and a number of fine residences on the bank of the Columbia River above the smelter.

An ample water supply is obtained from a five mile line of 14 inch and 16 inch wood pipe connecting with three different creeks. It reaches the smelter through two steel penstocks at a head of about 100 feet.

The fire protection system includes a 700 gallon Worthington centrifugal pump, with hydrants and hose reels at convenient points.

Coke and coal are obtained from the Crow's Nest Pass Coal Company's ovens and mines at Fernie and Michel, B.C., some 244 miles east of Trail. The quality is good, though rather high in ash.

Lime rock comes from the company's own quarry at Fife, B.C., on the Canadian Pacific Railway line. The rock assays about 50 per cent. lime or calcium oxide. Up to 200 tons per day is used.

As regards ore supply the smelter is in a very strong position. The Consolidated Company own the Centre Star Mines in Rossland, capable of producing 500 tons of gold copper ore per day. This is the chief single supply of ore. The company own the St. Eugene mine, the largest lead-silver ore producer in British Columbia, which is capable of producing 100 tons per day of high grade lead ore and concentrates. The company also have a lease on the Snowshoe mine at Phoenix, which ships 200 to 300 tons per day to the smelter and is easily capable of turning out two or three times this tonnage if pressed. It is worthy of note that the smelter is treating this ore from Phoenix, in spite of the long haul to Trail directly past the Granby smelter, of whose low smelting costs so much has been heard.



TRAIL SMELTER—FROM ACROSS COLUMBIA RIVER.

A large tonnage of custom ore is also handled. Copper and dry ores are received from the Boundary, Kamloops, East Kootenay, Lardeau, Slocan, Nelson, Ymir and other districts of British Columbia, and occasionally from the United States. Lead ores come chiefly from East Kootenay, Slocan and Lardeau districts.

The great diversity in composition of the ores received renders it possible to smelt without the admixture of

any barren fluxes except limerock. Lead bullion from other smelters and mill products are also handled.

The ore buyer is a technically trained mining engineer, and the securing of ore supplies well in advance of needs is one of the most important branches of the work, demanding not only a careful consideration of the metallurgical requirements, but a wide familiarity with the mining districts and most of the mines.

Treatment rates vary considerably with the nature of the ore and the distance of transportation, since the latter is included in the rates given. The freight and treatment rates on Rossland gold copper ore, for instance, has been reduced from $11 per ton in 1896 to $3.25 per ton at the present date. Dry ores receive rates varying from $8 to $12, and heavy lead ores an average rate of about $12, depending on the lead content. Concerning methods of treatment:—All shipments are carefully weighed-in on the railway scales, and are then put through the appropriate sampling mill, the resultant pulp and moisture samples going to the assay office. The mines representatives are enabled to inspect the whole process and obtain portions of the pulp and moisture samples for their own assay.

An extra pulp is kept under seal for umpire assay in case of dispute.

Formerly the Rossland and some other gold copper ores were first roasted in heaps to drive off excess sulphur, but of late years the amount of sulphur in the charges has been less and the custom is to feed the ore raw to the furnaces. The products of the furnaces consist of slag, which is granulated and carried away by streams of water, very conveniently and cheaply, and a matte which runs 10 per cent. to 15 per cent. copper. This matte is granulated by pouring into a stream of water, and the granulated product is treated in the O'Hara roasters and the roasted matte is briquetted in the briquette plant. As an alternative the granulated matte may be treated in the Huntington Heberlein convertors, the resultant mass simply being broken up and not requiring briquetting. In either case the roasted matte is re-smelted with certain selected ores and a high grade matte running 45 per cent. to 50 per cent. copper is produced. This product is shipped to the United States for treatment, as the Trail smelter does not yet possess copper convertors for the production of blister copper. The slag from this smelting is largely returned to the low grade furnaces for re-treatment.

The flue dust from the furnaces is collected periodically and briquetted, and the briquettes are returned to the furnace with succeeding charges.

Briquetting is done by mixing the flue dust or granulated matte with 5 per cent. of lime, and the moistened material is mixed in pugmills and pressed in the briquette presses. The necessary lime is burned in two small kilns on the premises, the limestone coming from the company's own quarry.

Lead ores, which are mostly in sulphide form, are crushed and mixed with a certain proportion of crushed lime rock. The mixture is bedded in the yards, a variety of ores being bedded together, so as to get a correct smelting mixture. This mixture is roasted at a low heat for eight hours in the Huntington Heberlein roasting furnaces. The resultant sinter is somewhat cooled and then fed gradually into the convertors on top of a small wood fire, air is then blown in and the mass begins to glow, and more sinter is fed in until the convertor is full of a glowing mass in about 8 hours. The mass is allowed to cool and is then dumped out and broken up. The product is fed to the blast furnace, with certain other high grade ores and products and the requisite amount of coke. The product from the blast furnace is lead bullion. This is cast into bars and sampled by punching and shipped up to the refinery. In the refinery the lead bullion is cast into anodes, which are placed in the tanks alternately with thin starting sheets of refined lead. The electrolyte contains lead fluo-silicate and other chemicals in solution. The electric current used is rated at 3,500 amperes at 80 volts. At the end of 8 days the lead has passed over on to the cathodes, which are taken out, washed, melted and cast into shipping bars. These bars run over 99.98 per cent. pure lead. The precious metals and impurities of the anodes remain as a black slime in the tanks. This is taken to the slimes plant, where it is washed, the washings being evaporated down to recover the electrolyte contained. The washed slime is dried and melted in a small reverberatory furnace, connecting with a system of flues, the dust from which is periodically collected and sent to the smelter for treatment. The product is a dore silver running about 950 fine. This is parted in sulphuric acid, the remaining gold is melted and cast and runs about 995 fine. The silver solution is run into tanks, heated by steam, where the silver precipitates on copper plates, the copper going into solution. The silver is melted and cast into bars weighing about 80 pounds. It runs about 999 fine.



TRAIL SMELTER FURNACE BUILDING.

The copper sulphate solution is run over to an evaporating plant, which it is crystallized out, re-dissolved, recrystallized out and put up in barrels.

Mr. A. J. McNab, metallurgist at the smelter, has worked out a process for recovering the 30 per cent. or so of antimony which the slimes contain, so that antimony will become one of the regular products of the works in the near future.

To recapitulate, the products of the works are:—Copper matte, carrying 50 per cent. copper and the bulk of the gold produced; fine gold, fine silver, refined lead, lead pipe, copper sulphate, and, in the near future, antimony.

The copper matte is sold to the United States smelters. The fine gold and silver to the United States mints at Seattle; fine silver also goes to the far east, etc. Lead is largely sold in Canada, the balance going to the far east or London. Analyses made by the Japanese Technical Department at Osaka, and published in the *Engineering and Mining Journal* of June 22nd, 1907, show that the Trail lead compares favorably with other well-

known brands, and is in fact probably the purest in the world. Copper sulphate is used by the farmers on the prairies to kill the smut in wheat.

The total number of employes averages about 500, a considerable number foreigners of several European nationalities. No Japs, Chinese nor Hindus are employed.

The power used in running the works is entirely electric, coming from Bonnington Falls at 20,000 volts; it is stepped-down by a battery of transformers to 550 volts for use in the works. The total power consumed runs from 2,500 to 3,000 horse-power.

The production of the works from the beginning to June 30th, 1907, has been 1,322,573 tons of a gross value of $28,786,146. At present production is at the rate of about $5,000,000 per year. With an adequate coke supply assured, this would become between $6,000,000 and $7,000,000 per year.

The refinery produces up to 75 tons refined lead per day, and about 1,800,000 ounces fine silver and 15,000 ounces fine gold per year. Most of the gold, however, and all the copper, which constitute the remainder of the valuable metallic shipments, are shipped in the form of high grade copper matte.

The quantity and variety of custom ores received, together with the assured supply from the company's own mines and the variety of products produced, on account of which the values produced are not dependent on the fluctuations in price of any one metal, place the smelter in a very strong position with an assured future.

The Consolidated Mining & Smelting Company are paying 10 per cent. annually on their capital stock, and have paid a total in dividends of $714,945 since the amalgamation of the company, January 1st, 1906.

The officers of the company are:—W. D. Matthews, Toronto, president; W. H. Aldridge, Trail, managing director; Jules Labarthe, Trail, manager of Trail smelter and refinery, and R. H. Stewart, Rossland, manager of mines.

MICA IN 1906

(Condensed from a Bulletin of the U. S. Geological Survey.)

Of the mica minerals only two are commercially valuable. These are muscovite, or potash mica, and phlogopite, or magnesia mica. Mica depends for its value upon its cleavage and the toughness, flexibility and elasticity of its cleavage sheets. The properties, combined with transparency and non-conductivity of electricity, render the varieties mentioned valuable in the industrial world.

Commercially mica is formed in rough blocks, sometimes with crystal outlines; thus crystals are often called books. In color mica is somewhat variable and generally muscovite is much lighter than phlogopite. Muscovite may be white, gray, yellow inclining to amber, brown, red and green. Phlogopite is generally some shade of yellow or brown to black, often possessing a coppery appearance, and is called "amber" mica from its color. Other colors observed in phlogopite are milky or silvery gray. The luster of muscovite is brilliant and glimmering on fresh surfaces, while that of phlogopite is less brilliant and more silvery or pearly.

Muscovite often contains inclusions of other minerals, either between the laminae or cutting across them. Common inclusions are magnetite, quartz, feldspar, garnet, and other mica crystals, with tourmaline, apatite, beryl, and rare minerals of less common occurrence. Inclusions of magnetite are in the form of minute crystals, often arranged in definite positions with respect to one another. Intergrowths of biotite possessing the same cleavage as the inclosing muscovite may occur. The various inclusions detract from the commercial value of the mica.

Occurrence.—Of the two valuable varieties of mica only one, muscovite, is found in deposits of commercial value in the United States. Commercially valuable muscovite is confined to pegmatite. As a coarse product of crystallization of pegmatite, mica is sometimes found in blocks more than a yard in diameter.

Mica crystals occupy various positions in pegmatite masses. Where the pegmatite has a typical granite texture the mica may be found evenly distributed through it. Often the large crystals will be found either in clusters at intervals through the "vein," in places partly connected by streaks of small crystals, or along one or both walls of the pegmatite. When there is a quartz streak within the pegmatite the mica occurs on either or both sides of it, being in places partly embedded in the quartz or occupying any of the positions noted above in the remaining portion of the pegmatite. The common forms of occurrence of pegmatite, commercially valuable for mica, are over-lapping lenticular-shaped bodies and sheets of more persistent extent. The minimum limit of thickness for a workable pegmatite body may be arbitrarily placed at from 1 to 2 feet for rich and regular bodies.

Outside of the United States, mica of commercial size has been found in India, China, Japan, Mexico, Brazil, Argentine, German East Africa, Australia, and other countries.

Mining Methods.—Where mica deposits are regular in content, direction, and extent, they may be, in Canada, all systematically mined. Irregular deposits do not lend themselves to such methods of approach.

In Canada there seems to be a stronger tendency for systematic mica mining than in the United States, especially in the phlogopite deposits in pyroxenic rocks, which are probably more regular in nature than most muscovite deposits in pegmatite. In India the deposits are more irregularly worked than in any other region, since nearly everything is done by hand, even to removing mica and waste from the mines.

Production.—In the United States the production of sheet mica for 1906 amounted to 1,423,100 pounds, valued at $252,248. The total production of scrap mica was 1,489 short tons, valued at $22,742. Canada in 1906 exported 913 short tons, valued at $581,919.

Prices.—For sheet mica the price per pound ranges from 13 cents for uncut mica, 1 1-2 inches by 2 inches, to $2.50 per pound for uncut sheets 6 inches by 8 inches. Sheets of manufactured selected mica run from 60 cents per pound for sizes 1 1-2 inches by 3 inches, to $6.75 for sizes 6 inches by 8 inches. Scrap mica sells for from $8 to $30 per short ton.

The executors of Andrew Marks Wiley are suing for $150,000 commission before Master-in-Chambers at Osgoode Hall for the sale of the Anthony Blum Mine, Wabigoon, Ont., to Hugo Von Hazen, New York, for $8,000,000. It is alleged that $10,000 was paid on account, and that the Laurentian Mines Company then took over the property and that Mr. Blum was given stock in it instead of cash. The vendor claiming that the transaction was altered, refused to pay the commission to Wiley.

STAMP MILL RECORDS

E. Percy Brown.

I have frequently felt the need of some simple method of tabulating mill data, particularly in the case of a small mill treating the ore from the development of a new property, where it is most essential to be able to follow every step in the treatment of the ore.

This can only be done by careful tabulation of the results of different methods of treatment, and in this way the method best suited to the ore can be accurately determined.

Although this form was primarily designed to meet such a case, yet I believe that a great deal of most valuable information would be derived from a similar tabulation of results where large mills are working on well-established propositions.

(TABLE No 1)

MILL RUN No.—

ORE FROM —— WEEK COMMENCING ——

DATE	SHIFT	ORE HOISTED	HOURS MILL RUN	CAUSE OF STOPS	MERC USED	MERC RECOV	NETT MERC USED	AMALG RECOV	ASSAY OF TAILINGS	REMARKS
TOTAL										
BAT FORWARD										
GRAND TOTAL										

I know that in some cases this is done; but it is a well-known fact that in most cases only a very crude attempt is made to record such data. The tables as given are intended for use on a free-milling gold ore, the battery tailings being concentrated and the concentrates saved for further treatment.

The writer believes that the points most necessary to watch on such a proposition are:—

(a) The feeding of mercury.

(b) The ratio of the gold saved inside the battery to the total free gold in the ore.

(c) The loss of mercury per ton of ore.

(d) The assay of the mill tailings.

These are to be carefully noted and compared, as the crushing capacity of the mill is increased or decreased by changing one or more of the four factors:—

(a) Number of drops per minute.

(b) Height of drop.

(c) Height of discharge.

(d) Size of opening in screen (i.e., mesh).

Any mill man will readily understand the importance of these things, and how essential it is that the relation of cause and effect should be carefully studied.

Table number 1 is intended to be used as a daily record, there being one sheet for each week. The totals are to be carried forward from one week to the next, and the final results, at the end of the run, entered on table number 2. When mercury is added to the plates this is included in the "mercury used," though of course it may be kept separate if desired.

The mercury is squeezed from the amalgam removed from the plates and recorded under the column "mercury recovered." The column "net mercury used" is the difference between the two previous columns and its total at any time gives the sum of:—

(a) Amount of mercury in the batteries.

(b) Amount of mercury in plate amalgam.

(c) Amount of mercury lost.

After some experience on a certain class of ore the man who has been keeping such a record should be able to arrive at a fairly accurate estimate of the amount of gold in the batteries at any time during the run.

The samples of mill tailings should be taken automatically every ten or fifteen minutes during the entire run and separate samples taken for each shift.

(TABLE No 2)

NUMBER OF STAMPS	WEIGHT OF STAMPS	TONS PER 24 HRS. CAPACITY	DROP IN INCHES	NUMBER OF DROPS	HEIGHT OF DISCHARGE	KIND OF SCREEN	BATTERY: WET AMALGAM	BATTERY: WET RETORT	BATTERY: PER CENT GOLD	PLATES: WET AMALGAM	PLATES: NET RETORT	PLATES: PER CENT GOLD	GOLD IN TAILINGS	ASSAY OF TAILINGS	CHARGE TO BATTERIES	SMELTED GOLD: WEIGHT	SMELTED GOLD: LOSS IN SMELTING	SMELTED GOLD: VALUE PER OUNCE	SMELTED GOLD: TOTAL VALUE	VALUE PER TON OF ORE
				DATE	TRIAL		MILL RUN No														
							COMMENCED ——									ENDED ——				

Table No. 2

PROFITS ON LOW GRADE ORE—SOME INSTRUCTIVE FIGURES

For the first six months of the current year the gold mines of the Witwatersand have earned an aggregate profit of £4,700,000. Companies for which detailed returns are available have netted £4,659,000, and the Vogelstruis Estate and the Orion Mines, together with one or two small producers, may be calculated to bring the full total up to approximately £4,700,000. In 1906 a total of £8,220,000 was earned, and at the rate of earning for the first six months the 1907 total may be anticipated at £9,400,000. For the last four months working costs in respect of sixty-three companies have been under 22s. per ton, the expenditure per unit during June being 21s. 6d., and the profit being at the rate of 12s. 4d. per ton. Last year the cost of expenditure worked out at 22s. 5 1-2d. per ton, the profit being at the rate of 12s. 1d. per ton. A study of aggregate profits, together with costs and profits on a per ton milled basis, show that, whilst working costs have been reduced by about one shilling per ton during the past year, the revenue per ton has also fallen by practically the same amount. This is the common history of Witwatersrand mining, and in future this particular phase is likely to be brought into much greater prominence than hitherto. Each reduction in the cost of operation brings a certain number of tons into the zone of payability, and whilst the mines are to-day dealing with ore worth just under 34s. per ton, it is not unreasonable to think that before very long 30s. will be the value of a Rand ton. If the present rate of profit-earning is to be maintained, working costs, it will be seen, must be brought down to about 17s. 6d. The relation of the cost of operation to the productive value of the Rand is a fascinating but highly intricate problem. It is extremely difficult even to approximate the additional amount of pay ore which a reduction of, say, 4s. per ton in the cost of working means to the Rand, but it is certainly enormous. In the earlier days of the Rand small mills and more expensive stores necessitated the working of richer ore than heretofore, but the days of very high costs and 12 dwt. ore are over. An instructive view of Rand mining economics may be obtained by estimating the cost of wining a sovereign's worth of gold. To-day it is costing 12s. 9 1-2d.; just previous to the war it was about 12s. 6d. Despite the fact, then, that working costs per ton have been very appreciably reduced since the 1899 days, the expenses entailed in winning a sovereign's worth of gold are higher to-day than in the period preceding the war. The obvious deduction is that the grade of ore milled has decreased more than working costs.

Of the sixty-two companies which declared profits in June, just 50 per cent. earned less than 10s. per ton. The Robinson, which is an exceptional proposition, earned £65,050, or 40s. 2d. per ton. Important mines like the Witwatersrand, which made £14,752, the Rose Deep with £63,100, and the Geldenhuis Deep with £14,050, each earned less than 10s. per ton. These facts serve to emphasize the importance of fully realizing that the Rand is a low grade field, and that in the deeper level future companies earning profits at the rate of under half a sovereign per ton will account for the greater part of the Rand's earnings.—*Exchange.*

Abstract of Judge Longley's Decision in the Suit of the Dominion Steel vs. Dominion Coal.

The Dominion Coal Company was in default in its deliveries during the months of August, September and October, 1906.

The contract makes it clear that coal suitable for the operating of an iron and steel plant is the basis of the bargain.

The defendant company proved that Dominion No. 6 and its workings are on the Phalen Seam.

It also established that No. 6 coal was fit for steam purposes and capable of being consumed in grates and furnaces, and the judge finds that coal from No. 6 pit was commercial coal.

The coal received by the Steel Company was carefully mined and picked but not reasonably free from stone and shale.

The rejected coal from No. 6 contained 15.63 ash and sulphur 6.63. The average of the coal delivered in the preceding year from other pits on the same seam was 2.3 sulphur and 7 per cent. ash.

The exact and only thing the parties intended was that coal should be furnished to operate an iron and steel plant.

Coal to operate an iron and steel plant must be coal with which such a plant can be operated.

The objects of courts is "to give efficacy to the transaction and prevent such a failure of consideration as cannot have been in the contemplation of the parties."

The Coal Company committed a breach of the contract and is liable to the Steel Company for all the loss and damage which result from this breach.

A referee should be appointed to ascertain and determine the damages.

The contract of October 20th, 1903, is in full operation, and the judge orders that after the damages are assessed a decree issue requiring the Coal Company to specifically carry out the terms of the contract.

The court has power to enforce such decree by the appointment of a receiver if any attempt were made to evade specific performance.

Concentrates				Average Value Tailings per Ton	Total Value of Ore per Ton	Percent Total Value Saved	Mercury						Remarks
Weight	Value per Ton	Total Value	Value per Ton of Ore				Total Mercury used	Total Merc. Recov.	Net Merc. used	Ozs Gold Recov. for 1 oz Nett Merc. used	Loss of Merc.	Loss per Ton of Ore Crushed	
—	—	—	—	—	—	—	—	—	—	—	—	—	

Continued.

COAL BRIQUETTING IN THE UNITED STATES*

By Edward W. Parker, Washington, D.C.

(Toronto Meeting, July, 1907.)

[Note.—The material from which this paper has been prepared was collected for the *U. S. Geological Survey Bulletin,* Contributions to Economic Geology, 1906, and appears also, though in somewhat more extended form without illustrations, in that publication.]

Although the briquetting of coals and lignites has been carried on for many years in Europe, and has reached a particularly high state of development in France, Belgium and Germany, it has made comparatively little progress in the United States. The causes for the backwardness of the United States in this regard are several, and first among them has been the abundant supply of cheap raw fuel with which the manufactured article has to compete. With our millions of acres of coal-productive territory, from which the production can in most cases be cheaply extracted, it has appeared in many districts to be more economical to waste the slack or culm, which constitutes a considerable percentage of the product, than to attempt to save it at the additional expense required for briquetting. It is for this reason that the view in all sections of the anthracite region of Pennsylvania is marred by the unsightly culm banks which encumber the ground, and that in some of the bituminous districts one sees huge piles of unmarketable slack allowed to burn up in order to get ride of them. When the coal is of a coking quality, or when the slack can be used for steaming purposes, these losses are not sustained, but many thousands of tons of what might be converted into usable fuel have been wasted every year simply because of the increased expense involved in its preparation.

The rational development of the briquetting industry has also been retarded by the attempts to exploit patented or secret processes for which all kinds of extravagant claims have been made, but which have almost invariably proved expensive and unprofitable, and the investment of capital in enterprises of this character accordingly has been discouraged. The Patent Office records teem with patents issued on all sorts of inventions relating to binders, many of which are as fanciful as the idea of perpetual motion.

Another reason for the failure to build up a briquetting industry in the anthracite region of Pennsylvania, where the best opportunity for its development is offered, has been the opposition shown by some of the operators to the introduction of a manufactured domestic fuel which would come into competition with the prepared sizes of anthracite. And such an opposition is natural. The competition of bituminous coal has almost entirely shut out anthracite as a steam fuel. The use of coke has supplanted the use of anthracite for iron-making, and the use, for domestic purposes, of coke and gas made from bituminous coal is growing. Owing to the greater depths to which the mining of anthracite is being carried, the thinner and less favorably located beds which are being worked, and to the increasing tendency in labor cost, the mining and preparing of anthracite are constantly becoming more expensive on one hand, while competition is becoming more keen on the other. A certain rate of production must be kept up for the protection of the properties themselves, and when all these conditions are considered, the unfavorable attitude on the part of the operators toward further competition is at least realizable.

Still another reason which has been assigned, rightly or wrongly, for our halting progress in fuel-briquetting has been the lack of assurance of a regular supply of coal tar pitch at reasonably low prices. Out of the many, and sometimes costly, attempts that have marked the incubating period of briquetting development has grown the knowledge that coal tar pitch must be relied upon to supply, in the Eastern States at least, all, or the greater part, of the binding material. In California, Arizona, and other parts of the far West, asphaltic pitch, the residual product from the refining of the heavy asphaltic base petroleums of that region, has been, and is now, successfully used in recently constructed briquetting plants. But in the East, coal tar pitch is the base of the economically successful cementing material. The extended investigations carried on at the United States Geological Survey coal testing plant at St. Louis bear out this statement.[1] These investigations included experiments with all kinds of organic and inorganic binders, embracing, besides coal tar pitch, such materials as rosin, sugar-house refuse, molasses, acid sludge, quicklime, and various mixtures. The results show that either coal tar or asphaltic pitch are the only really successful binders. Any materials used with them must possess above all others the essential virtue of cheapness.

But while it is claimed that the briquetting industry has been held back by the lack of assurance of a steady supply of coal tar pitch, it also happens that one of the reasons assigned for the comparatively slow development of the by-product coking ovens in the United States in the last few years is due to the lack of a profitable demand for coal tar, one of the principal by-products of the retort coke ovens. It is well known that the demand for creosoting oils to be used for the preservation of ties, bridge timbers, etc., by the railroad companies is far beyond the present domestic production of that coal tar product, and the statistics compiled by the Bureau of Statistics, Department of Commerce and Labor, show that our imports of the chemical products of coal tar exceed $10,000,000 in value yearly. To the ordinary observer it would appear that the conditions here presented afford an opportunity for the organization of a community of interests which would prove profitable to the projectors and beneficial to the general public. The constantly increasing expense involved in the mining and preparation of anthracite coal is making that commodity slowly but surely more and more of a luxury, and manufactured fuel which will take the place of anthracite for domestic use, particularly among consumers of moderate means, appears to be needed. This is especially true in the northeastern section of the United States.

Two of the briquetting plants recently constructed, and which are discussed in more detail in the following pages, indicate somewhat of a "getting together" of the coal tar producing and the briquetting interests. These are the plants of the United Gas Improvement Company, at Point Breeze, Philadelphia, and of the Semet-Solvay Company, at Del Ray, Mich. Both companies are producers of coal tar, and the plants have

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been constructed for the purpose of briquetting mixtures of anthracite culm and coke breeze.

It appears now, moreover, that the period of failure and discouragement has passed, and that the manufacture and use of briquetted fuel is being placed upon a substantial footing. The first successful plant in the United States of which I have any definite knowledge was one built to Stockton, Cal., a few years ago by the San Francisco & San Joaquin Coal Company. This plant, unfortunately, was entirely destroyed by fire in 1905, and the plans for its reconstruction, this time at San Francisco, were interrupted by the earthquake and fire which destroyed a large portion of that city in April, 1906.

During the past two years a number of briquetting plants have been constructed, and as complete descriptions of them as it has been possible to obtain are given in the subsequent pages. Some of them have been put in operation since January 1st, 1907.

New York, N.Y.

New Jersey Briquetting Company.—During 1904 and 1905 the New Jersey Briquetting Company of New York constructed at the foot of Washington street, in Brooklyn, a plant for exploiting the briquetting process of the Zwoyer Fuel Company. This plant was intended to be operated in connection with a coal yard on Adams street, but during the construction of the piers and anchorages for the new Manhattan bridge the company was prohibited from operating the tramway from the coal yard to the plant. This naturally interfered with the operations of the plant, and as extensive storage capacity, either for raw material or for the product, had not been provided for, the work already done has been accomplished under much disadvantage. The prohibition put upon the tramway, and the lack of dock facilities for loading and unloading material, have crippled the palnt to such an extent that what was supposed to be an excellent location has turned out to be an unfortunate one, and the present methods of receiving and handling the material make the operations too expensive for successful competition of the briquettes with raw fuel. As a result of these unfortunate conditions it is proposed to remove the plant to a site better adapted for the receiving, storage, and shipment of material. The officials of both the New Jersey Briquetting Company and Zwoyer Fuel Company are entirely satified with the experimental results, and are confident of making the enterprise a commercial success.

A description of the plant in Brooklyn has already been published,[2] and the following notes are partly abstracted therefrom and partly furnished by Mr. Virgil H. Hewes, treasurer of the Zwoyer Fuel Company.

Prior to the construction of the plant in Brooklyn, the Zwoyer Fuel Company had built a small experimental plant in Jersey City, N.Y., but while this was of sufficient capacity for this purpose, it was not large enough to be operated as a commercial undertaking, and was abandoned.

It may be stated here that after a considerable expenditure of time and money in experimenting with different kinds of binders, coal tar pitch was decided upon as best suited to the work, a decision which has been generally reached in the Eastern States, as asphaltic pitch has with a binder composed of 6.25 per cent. of rosin and been adopted in the far West, where that article is cheaply obtained. During the progress of the experimental work, about 200 tons of briquettes were made oil, 1.5 per cent. of flour and water, and from 6 to 10 per cent. of bituminous coal, the body of the briquette being anthracite dust. About 900 tons of briquettes were made, using from 5 to 7 per cent. of rosin and oil and 10 per cent. of bituminous coal; 400 tons were made with from 5 to 7 per cent. of wood pitch and 10 per cent. of bituminous coal, and 1,500 tons were made with from 6 to 7 per cent. of coal tar pitch alone. In applying the binder during the last three experiments an atomizer was used.

The plant in Brooklyn has a capacity of 10 tons per hour, and was built for the purposes of demonstration. During the winter and spring of 1905-6 about 3,000 tons of anthracite briquettes were made and sold. The price received was $5 per ton of 2,000 pounds at the plant, $5.50 per ton delivered, and $6.60 per ton in bags of 100 pounds each. These prices were $0.50 below the prices of the domestic sizes of anthracite.

A plan of the building,[3] which is nearly triangular in outline, is shown in Fig. 1, which gives also the general arrangement of the machinery.

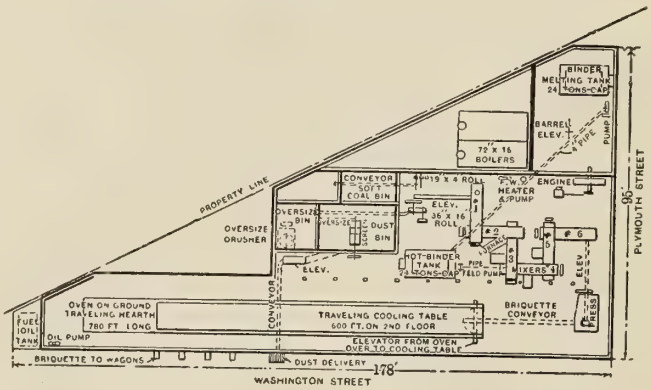


Fig 1—Plant of N. J. Briquetting Co., Brooklyn, N.Y.

The anthracite dust is received on Washington street at the end of a screw conveyor, which carries it to the foot of an elevator, where it is lifted to the top of the plant and is then spouted to a screen located over the dust bin. The coarser material is spouted either to the boiler room or to an over size bin in the rear of the dust bin, and from here fed into a crusher and then passes to the foot of the dust elevator, where it is again carried to the screen. The dust is drawn from the dust bin by a conveyor driven from a variable speed countershaft, and is fed to the 16 inch by 36 inch roll crusher. It then passes to an elevator which carries it to the mixers. After passing through mixers Nos. 1 to 6 it is carried to the second floor, when it falls into the press hopper.

From the press the briquettes are carried by a belt conveyor to the baking oven (when smokeless briquettes are wanted), and are then elevated to and distributed upon the cooling table, which is located on the second floor. After cooling, the briquettes are run into chutes and loaded into wagons for delivering, or are stored. In New York the briquettes sold readily when not baked.

On one side of the dust bin a soft coal bin was built from which soft coal was fed into a 19 inch by 4 inch roll crusher and passed to the same elevator which carries the dust to the mixers. Development has shown that it is not necessary to use the soft coal with anthra-

[1]United States Geological Survey Bulletins Nos. 261 and 290, and Professional Paper No. 48.

[2]*Iron Age,* vol. lxxvii., pp. 1330 to 1333 (1906).

[3]*Iron Age,* vol. lxxvii., p. 1330 (1906).

cite dust. However, this bin is used when experimental runs are made requiring the mixing of different materials with the dust.

The Binder.—Coal tar pitch, used as a binder, is received on the Plymouth street side of the building. It is hoisted to the second floor by means of a barrel hoist, where the staves are removed and the pitch is thrown into the binder melting tank (the tank holding about 15 tons of pitch), and pumped by means of a rotary pump into the storage or hot binder tank, where it is kept heated.

The Mixers.—Fig. 2 shows a plan and elevation with the relative position of the connecting mixers and heat flues, and Fig. 3 shows a typical section of a mixer unit. The number of units necessary in a mixer depends upon the material to be briquetted and the condition in which it is received. At this plant six were used, and have proved well adapted to the handling of coal, hard and soft, wet or dry, coke breeze and even iron concentrates.

The dust enters No. 1 mixer at *C*, Fig. 2, and is carried through mixers Nos. 1 to 6 in the direction indicated by the arrows to a point, *O*, mixer No. 6, and then by conveyor to the press. In passing through mixers Nos. 1 and 2 the dust is heated by the furnaces, F_2 and F_3,

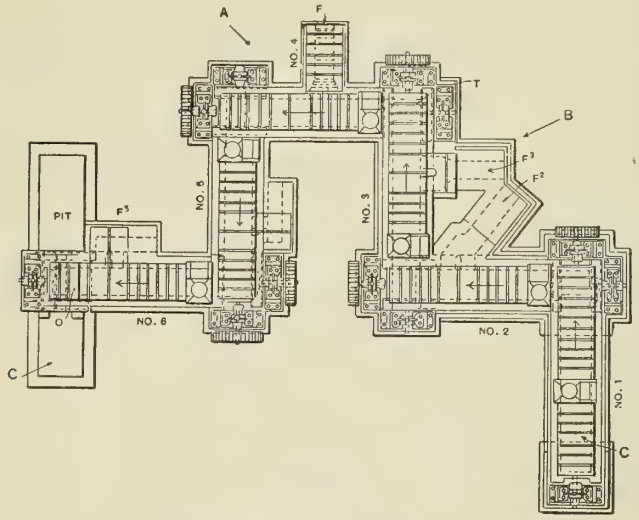


Fig. 2—Plan of the Mixers.

to drive off all the moisture. The coal tar pitch, being previously heated, is pumped from the storage tank by a small rotary pump driven from a variable speed countershaft, which regulates the percentage of pitch used.

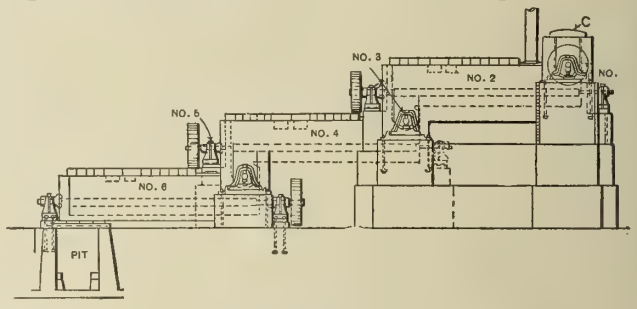
The pitch is delivered to the mixer No. 3 at the point, *T*, Fig. 2, where it is atomized by means of a steam jet.

The above apparatus and process are patented.

The Press.—The roll type of press, shown in Fig. 4, is used, the rolls being built up of discs which are milled to form the pockets and are then assembled and bolted together on the shaft. This method, as well as the design of the briquettes, is patented. Two sizes of briquettes are made, 1 7-8 inch by 1 7-8 inch by 1 1-4 inch and 2 1-8 inch by 2 1-8 inch by 1 3-8 inch. The briquettes are square "pillow" or "pin cushion" shape. The smaller ones weigh 2 ounces and the larger 3.3 ounces.

Cooling Table.—The cooling table consists of three endless belts composed of steel plates carried at their ends by sprocket chains, the belts being placed one over the other and carrying the briquettes back and forth six times over a distance of 84 feet, making a total travel of 504 feet. The briquettes are then run into bins or loaded into wagons.

Staten Island Plant.—The Briquette Coal Company, J. P. Egbert, manager, No. 2 Stone street, New York, N.Y., has just completed the construction of a briquetting plant at Stapleton, on Staten Island. This plant is constructed for the purpose of using anthracite dust with coal tar pitch as the basis of the binding material. The anthracite dust is used as delivered. The plant does not possess any novelties in its design, except that there



No. 2—Vertical Section of Mixers.

are two presses of radically different types. One of these is of German manufacture, built at the works of Schüchtermann & Kremer, of Dortmund. This press is of the plunger type, in which the manner of feed, compression and ejection is similar to the Johnson (English) machine used at the United States Geological Survey testing plant at St. Louis, except that the disc containing the compressing moulds is set and revolves horizontally instead of vertically. The briquette is parallelopiped in shape with the end edges rounded. Its dimensions are 4.75 by 2.25 by 2.5 inches. Each briquette weighs about 1.5 pounds and has a specific gravity of about 1.24.

The second press is what is generally classed as the Belgian type, similar to the one described as the "American" machine used at the United States Geological Survey testing plant. This particular machine was made at the works of H. Stevens, at Charleroi, Belgium. The product is of the eggette pattern, which is more desirable for domestic use than the larger briquette. The eggettes weigh about 5 ounces, and have a specific gravity of 1.37. The manager of the company, Mr. Egbert, extended to me every courtesy possible, but unfortunately was not able to furnish any complete drawings or other illustrations, the plant having been constructed without them. The total capacity of this plant with both presses in operation is 120 tons of briquettes per day of

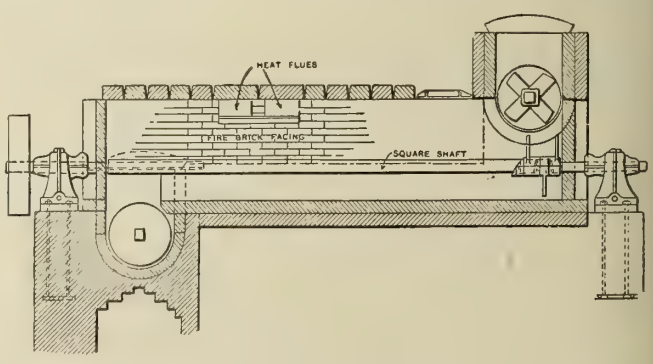


Fig. 3—Section of a Typical Mixer.

10 hours. The German machine will turn out 4.5 tons, and the Belgian machine 7.5 tons per hour.

South Brooklyn Plant.—Another plant, which has just been completed as this report is written, is that of the National Fuel Briquette Machinery Company, of New York, N.Y. This plant is located at the foot of Court and Smith streets, Brooklyn, and close to the Gowanus

canal, by which the materials to be used can be brought in barges and discharged at a minimum of expense. While intended to be operated upon a commercial basis, it may be considered rather as a demonstrating plant. It is intended for the use of anthracite dust with coal tar pitch as a binder. The press is of the Belgian type, producing eggettes or "bouletes," somewhat smaller than an ordinary hen's egg, and made exclusively for domestic use. The machinery used in this plant was patented in this country[4] by Mr. Robert Devillers, with whom I visited the plant, and to whom acknowledgments are made for courtesies extended. The eggettes produced by this plant are much smaller than those ordinarily made, weighing only about 1.5 ounces each, and having a specific gravity of 1.3.

North American Coal Briquette Company.—The company, with office at 177 Broadway, New York, N.Y., has been incorporated for the purpose of exploiting the Forst briquetting process, which comprises chiefly the material to be used as a binder, part of which, though kept secret, consists principally of coal tar pitch. The merit claimed for the secret ingredients of the binder is a great economy in the quantity of binder used for the manufacture of superior briquettes. The company has negotiated for the purchase of a Duprey (French)

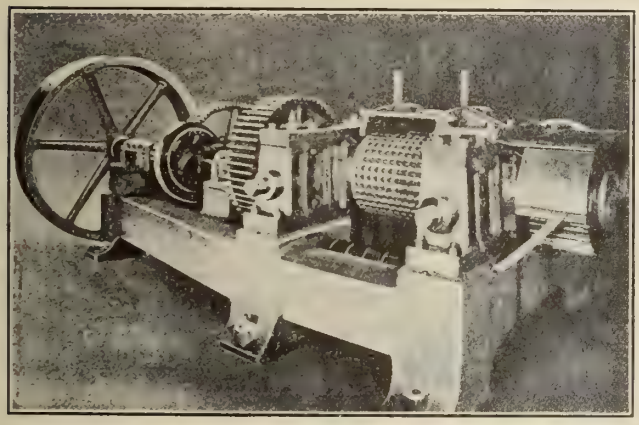


Fig. 4—Briquetting Press of the N. J. Briquetting Co.

machine, and has sent 10 tons of anthracite coal and one ton of binder to Paris for the purpose of demonstratting the claims made for the process controlled by the company.

The Mashek Briquetting Process.—The briquetting machine designed by Mr. G. J. Mashek (now with the Traylor Engineering Company, New York, N.Y.) has been described in detail by him.[5] The process was designed for the purpose of overcoming the objections to the use of briquetting machinery which had developed, principally through the failure of certain foreign-made machines to meet the requirements of the American trade. When starting on the development of his plans, in 1903, the general type of machinery in use in Europe was that making the large rectangular briquettes, weighing from 7 to 20 pounds each, and these proved unsuitable to American use. In designing his press Mr. Mashek adopted the Belgian idea of moulds contained in the peripheries of two tangential wheels, but instead of the eggette pattern, developed one which minimizes the blank spaces between the moulds and produces a briquette of pillow or pin cushion shape.

[4]U. S. Patent No. 799,149, Sept. 12, 1905.

[5]*Iron Age,* vol. lxxvii., pp. 1330 to 1333 (1906).

A view of the Mashek press, Fig. 5, shows the moulds on the periphery of the cylinders, and Fig. 6 is another view of the press.

The Traylor Engineering Company has recently built for Mr. E. B. Arnold a Mashek press, which has been installed at the foot of West 47th street, New York,

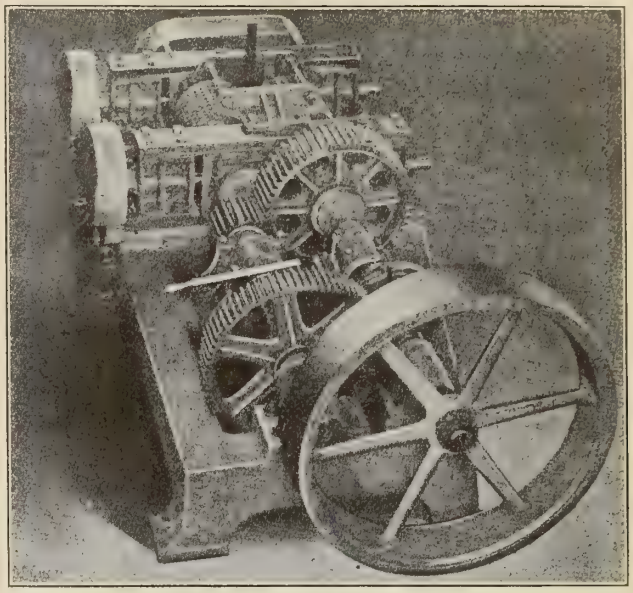


Fig. 5—Mashek Press—Moulds on Periphery of Cylinders.

N.Y. The building in which this is located was designed and erected for, and originally equipped with, a different type of machinery, but the briquettes made proved to be of a shape and character unsuited to the trade, and the cost of manufacture was also too high to enable the briquettes to compete with natural coal. When it was decided to substitute a Mashek press for the old one, it was also deemed advisable to use the same building, which is a substantial one, and also, as far as possible, the old machinery (such as elevators, shafting, power plant, etc.), which was practically new and in good order, but which did not permit of the most desirable arrangement.

The new press installed has a capacity of about 14 tons per hour of 2 ounce briquettes, but on account of

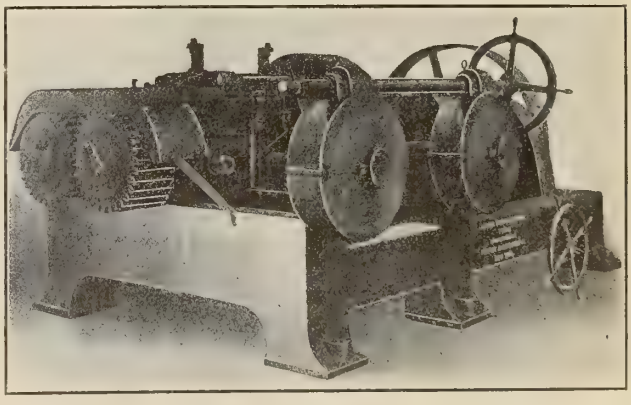


Fig. 6—Mashek Press Complete.

using so much of the old equipment it is impossible to handle sufficient material to keep the machinery running at its full capacity, and it is now operated at the rate of about 10 tons per hour. The cost of labor, fixed charges and other expenses being the same, the cost of production is slightly higher per ton of briquettes than would

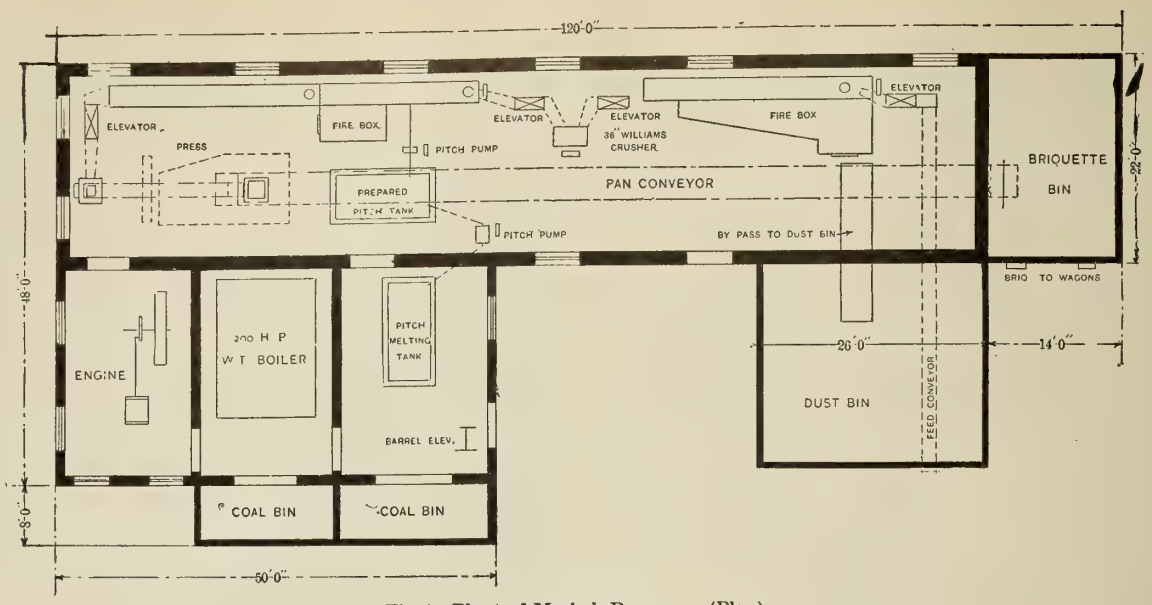


Fig. 7—Plant of Maskeh Process——(Plan).

have been the case if the plant was operated up to its maximum capacity. The size of the briquettes to be made has been determined by putting them on the market and selling them for domestic purposes, starting with 1 ounce briquettes and running up to 3 ounce. It was found that the majority of users preferred a 2 ounce size, which corresponds with the stove coal size of anthracite. The weight, of course, will vary with the nature of the dust from which the briquette is made, and it has been found that in using coke breeze a 2.5 briquette is most desirable, and about a 3 ounce if made of soft coal and lignite. The press is so designed that a change of the mould shells can be made in about 2 hours.

The plan and elevation of the Arnold plant are given in Figs. 7 and 8. The arrangement of the machinery is shown in Fig. 8. The anthracite dust is elevated to the dust bin, from which it is drawn by a feed conveyor so arranged that the feed is constant and can be regulated as desired. This conveyor discharges into a chain elevator, which in turn discharges into a battery of five 18 inch rotary driers and heaters. These are super-imposed one above the other and all bricked in. The material is conveyed through these driers by means of screw mixers until it passes into the following elevator.

On the side of these driers is constructed a furnace, the products of combustion from which are distributed into the driers through openings into the different units, so that no unit gets heat sufficient either to char the dust or to burn out the ironwork of the paddle conveyor. An exhaust fan draws off the products of combustion and the moisture. The temperature of the discharge gases and moisture from the drier rarely exceeds 212 degrees F. After the material passes out of the drier into the elevator it is elevated and dropped into a 36 inch Williams pulverizer, where the larger pieces are crushed, so that everything passes through about a 12 mesh screen. From the pulverized the material is again elevated to another series of mixers and coolers similar in construction to the driers. The anthracite dust at this point has a temperature of about 300 degrees F. The coal tar pitch is here introduced by means of a pitch pump so arranged as to deliver a definite quantity of pitch, as desired. Alongside of this last battery of mixers is a small furnace which heats the two upper mixers, maintaining an even temperature of the mixture and not allowing it to stiffen or set. From the last mixer the material drops to an elevator which takes it up to the second floor and discharges it on to an 18 inch belt con-

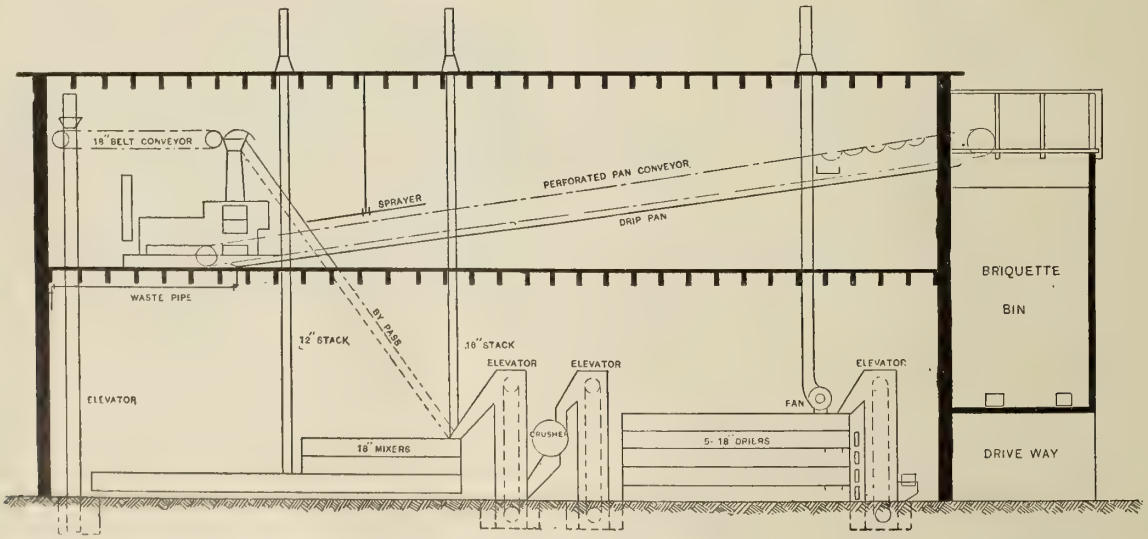


Fig. 8—Plant of Mashek Process (Elevation).

veyor, which delivers the material over the press and into the hopper. The press is run continually, discharging the briquettes into a perforated pan conveyor, which conveys them to the briquette bin. The briquettes while in this conveyor are subjected to a heavy spray of water in order to cool and clean them.

The coal tar pitch used in this plant is of the ordinary roofing hardness; it is delivered by lighter on an adjacent dock and carted to the pitch melting house, where it is melted in a tank 6 feet wide, 12 feet long, and 8 feet deep.

This pitch melting tank will hold about 22 tons of pitch, which requires in the neighborhood of 20 hours to melt. After the pitch is melted and brought up to the proper temperature for use it is drawn off by means of a large pitch pump into the "prepared pitch tank," from which it is pumped into the mixers.

This plant requires about 125 h.p. to turn out 10 tons per hour. It has been in operation about two months and is said to be giving excellent results. The product is used almost entirely for domestic purposes, and commands the same price as the best grade of prepared anthracite coal in the New York market. A large portion of the output is put up in paper bags and handled by grocers and small coal dealers the same as charcoal or crushed coke. The bag trade caters to the poor people who do not buy in large quantities, and is a considerably cleaner method of distributing the product than that formerly used.

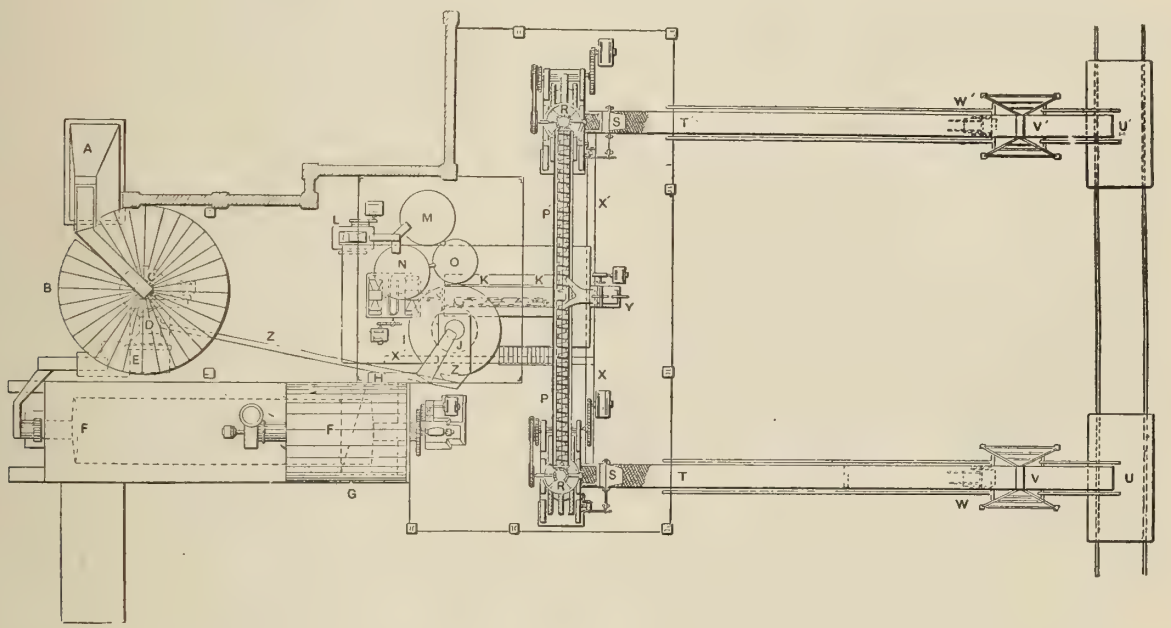


Fig. 9—Plant of United Gas and Improvement Co., Philadelphia (Plan)

Out of the briquette bin the briquettes are handled the same as ordinary coal, and experience has shown in this and other plants that abrasion or breakage averages about 3 per cent., which is slightly less than with ordinary prepared coal.

The cost of manufacture is as follows:—

Pitch—

Using 6 per cent. of pitch at $10 per ton	$0.60
Deducting increased weight of product due to 6 per cent. of pitch	0.30
Net cost of pitch	$0.30

Fuel—

For boiler, broken coal and screenings, broken briquettes, 4 tons per day of 10 hours, at $2.50 per ton	$10.00
Per ton of briquettes	0.10
For heaters, driers and pitch melting, 3 tons at $2.50 per ton=per ton of briquettes	0.075

Labor—

	Per day.
1 foreman	$5.00
2 pitch melters	3.50
1 dust bin man	1.75
1 engineer	3.50
1 man on second floor	1.75
1 man on ground floor	1.75
1 night watchman	1.75
1 oiler	1.75
	$20.75
Per ton of briquettes	0.21

Miscellaneous—

Wear and tear, per ton of briquettes	0.21
Lubricating oil, per ton of briquettes	0.01
Insurance	0.005
Interest on capital invested, $40,000, at 6 per cent.	0.10
Office expense, telephone, stenographer and stationery, $2,000 per annum	0.09
	$0.99
Anthracite dust at $1.40 per long ton=per ton of briquettes	1.25
Total cost of briquetting	$2.24
Re-briquetting 3 per cent. of breakage and abrasion, charging it back to plant as dust, per ton of briquettes	0.06
Net cost per ton of briquettes	$2.30
Wholesale selling price in bin	4.80
Net profit per short ton	$2.50

PENNSYLVANIA.

It might be supposed that the briquetting industry would have its greatest development in or near the anthracite region of Pennsylvania, where a plentiful supply of raw material is available in the great culm banks created through the many years of mining, and in the still large amount of fine coal produced at the breakers for which no profitable market has yet been found. Up to the present time, however, there are but two briquetting plants in operation in the State, one at Point Breeze, in the City of Philadelphia, and the other at Dickson, a few miles from Scranton. Both of these were put in operation in 1906. The plant at Dickson is in the immediate vicinity of the mine of that name, operated by the Delaware, Lackawanna & Western Railroad Company, and uses the fine coal or screenings, below marketable sizes, coming from the washery operated in connection with the mine. The owner of this plant, the Scranton Anthracite Briquette Company, withholds information relative to the details of its operations. I have been informed, however, by one of the officials of the company that the base of the binding material used is coal tar pitch, and that the plant is producing at the present time—April, 1907—from 300 to 325 long tons of briquettes per day. It is the intention to double this output by running the plant night and day. The briquettes are of the oval or eggette shape, the press being of the Belgian type, and similar to the "American" machine used at the testing plant of the United States Geological Survey at St. Louis during the exposition period.[6] The entire product is taken by the Delaware, Lackawanna & Western Railroad Company for use, principally, on its locomotives.

The other plant, at Point Breeze, is owned and operated by the United Gas Improvement Company, and was constructed for the purpose of utilizing the coke breeze produced at the gas houses of the company, and in this case, as in the case of the plant at Dickson, the product is not placed upon the market but is used by the company in its retorts for the manufacture of water gas. I am indebted to Mr. W. H. Gartley, Engineer of Works of the United Gas Improvement Company, for the following detailed description of the plant, and for the accompanying illustrations, Figs. 9 and 10.

It has been found advantageous to use a mixture of anthracite culm and coke breeze, with from 5 to 7 per cent. of coal tar pitch as a binder. The proportions of culm and coke used are variable, according to the quantity of material on hand. At the time I visited the plant—November, 1906—three parts of culm to two parts of coke were being used. The press is of the Belgian type, producing eggettes about the size of a goose egg. The rated capacity of the plant is 10 tons of eggettes per hour. It has been in operation regularly, producing 90 tons per 9 hour day, except when it has been shut down for repairs and changes. Figs. 8 and 9 show the arrangement of the plant.

The breeze or screenings from the coke screen (not shown on the diagram) of the coal gas plant fall into a pocket or hopper, *A*. Into this pocket is also dumped the culm. The contents are raised by an elevator into the storage tank, *B*, discharging through the funnel-shaped bottom on to the automatic feed table, *C*, by which a measured stream of the material is continuously poured, part into the crusher, *D*, and part directly into the hopper, *E*, below the crusher. The material is then elevated and discharged into the drier, *F*, *F'*. The dried material, together with the dust from the dust chamber, *G*, *G'*, of the drier is discharged into the hopper, *H*, *H'*,

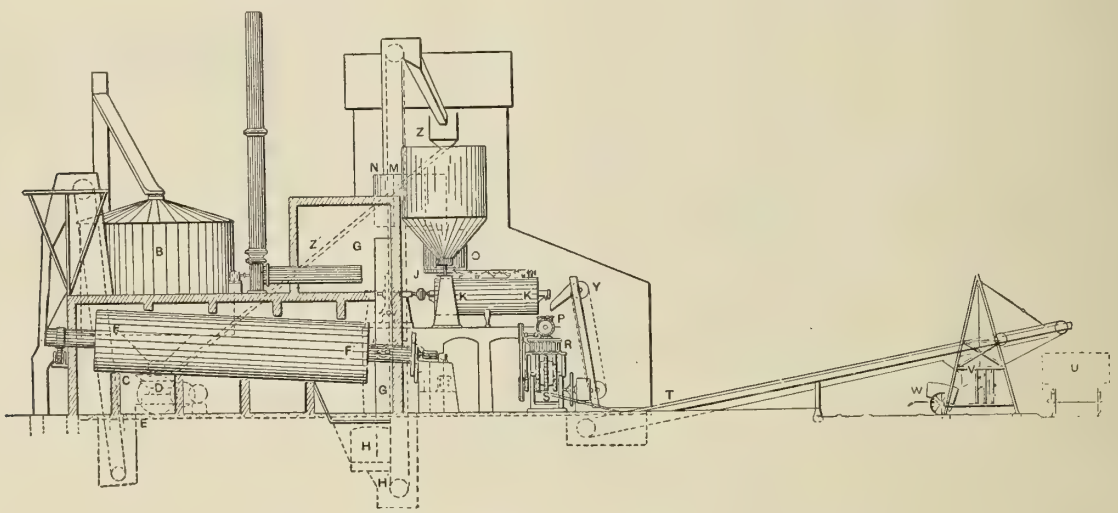


Fig. 10—Plant of United Gas and Improvement Co. (Elevation).

elevated and discharged through a shaking screen into the storage tank, *I*, located above the mixer. All material not fine enough to pass through the screen, *Z*, is returned by a spout, *Z'*, to the crusher, *D*. The dried material in tank, *I*, is discharged through the funnel-shaped bottom on to the automatic feed table, *J*, by which a measured stream is continuously poured into the mixer, *K*, *K'*. Into the feed end, *K*, of the mixer is also poured a continuous stream of liquid pitch through a positive measuring faucet (not shown), driven from the driving mechanism of the mixer through a variable speed device (not shown). The pitch its brought into the building as broken from the pitch bays of the tar distillery, fed into the pitch cracker, *L*, elevated and discharged into the large steam heated pitch storage tanks, *M*. *N*, where it is melted. From these tanks the melted pitch is drawn, as required, into the smaller steam heated tank, *O*, to which the faucet, previously mentioned, is attached.

The warm, dry, and continuously measured crushed breeze and culm, together with the melted and continuously measured pitch, are thoroughly mixed and kneaded in the steam jacketed mixer, *K*, *K'*. The mixed mass is discharged from the mixer, divided (devices not

[6]United States Geological Survey Bulletin No. 261, and Professional Paper No. 48.

shown) into two streams and carried by two mixing conveyors, *P, P'*, allowing time for cooling and setting, into the feed pans of the two presses, *R, R'*, purchased in France. From the feed pans the material is fed to the presses, which press out the eggettes and discharge them on to the shaking screens, *S, S'*, below, which screen them from the waste and fines. They are then discharged on to the woven wire belt conveyor, *T, T'*, giving the eggettes time to cool and set, and conveyed either to the cars, *U, U'* or to the hoppers, *V, V'*, from which the buggies, *W, W'* for the generator house are filled.

The waste and fines from the shaking screens, *S, S'*, under the presses, are conveyed by conveyors, *X X'*, to the hopper, *H'*, at the discharge of the drier.

Screenings from the eggettes taken from the storage piles are returned by an elevator, *Y*, to the discharge of the mixer and assist in the cooling of the heated mixture.

(To be continued.)

THE AUSTRIAN IRON INDUSTRY DURING THE LAST 25 YEARS*

By Wilhelm Kestranek, General Manager of the PragerEisen-Industrie-Gesellschaft and of the Böhmischen-Montan-Gesellschaft.

At the meeting of the Iron and Steel Institute, held in this city twenty-five years ago, the celebrated Professor Peter von Tunner described the iron industry of Styria and of Carinthia as representing the iron industry of the whole of Austria. He warned the members present at the meeting who were prepared, like you are now, to visit the centres of production of the Austrian iron industry, that they might be disappointed in their expectations, and his statements principally dealt with the reasons why the Austrian iron industry generally, and that of Styria and Carinthia specially, had remained stationary, and had been surpassed by that of England, of Germany, and even of France and Belgium.

He referred to the proud past of the ancient Alpine iron industry, and made due mention of the legend that the nails with which Christ was crucified were made of Noric iron obtained by the Romans from the Alpine districts. From the description of Peter von Tunner, the Austrian iron industry appeared to play the role of an impoverished nobleman, who, whilst regarding the future with apprehension, recalls the past with pride. The iron industry of the monarchy has, however, not resigned itself to this role. Indeed it has spared no endeavor to maintain its position, and I believe that, viewing the development of the home iron industry during the last twenty-five years, I am in a position to state that these endeavors have been successful, even if the industry, for reasons which will be considered later, has not reached that degree of development which the leading iron and steel producing countries have reached during the last twenty-five years.

In order to ascertain what progress has been made it will be necessary to compare the present production of pig iron with that of twenty-five years ago. In the year 1882 the world's production of pig iron, which in the year 1807 had been 760,000 metric tons, had reached about 21,000,000 metric tons. To this total the most important producing countries contributed the following proportions:—

	Metric tons.
Great Britain	about 8,600,000
United States	about 4,600,000
Germany, including Luxenburg	about 3,400,000
France	about 2,000,000
Belgium	about 700,000
Austria-Hungary	about 600,000
Russia	about 400,000
Sweden	about 400,000
Spain	about 100,000

The world's annual production of pig iron is at the present time about 61,500,000 metric tons; and the various iron-making countries now stand in the following order:—

	Metric tons.
United States, with about	27,000,000
Germany, including Luxemburg, with about	12,800,000
Great Britain, with about	10,100,000
France, with about	3,400,000
Russia, with about	2,800,000
Austria-Hungary, with about	1,900,000
Belgium, with about	1,500,000
Sweden, with about	600,000
Spain, with about	400,000

From the above it will be seen that the iron industry of the monarchy, which twenty-five years previously held the sixth position among iron-producing countries, still occupies the same position, while in the meantime other countries have undergone many changes. For instance, Great Britain has had to cede the leading position to the United States, and during the last few years has also been surpassed by Germany. France, where the conditions of the iron industry resemble in many respects those of this country, has been able to maintain its place in the fourth position. The fifth place, which is now occupied by Russia, was taken from Belgium, whose production of iron formerly exceeded that of Austria-Hungary.

The Austrian iron industry contributes the principal share to this increase in the production of pig iron in Austria-Hungary, and the increase approaches to that of Great Britain during the same period. Of the 612,000 metric tons of pig iron produced in 1882 in Austria-Hungary, 436,000 tons were produced in Austria and 176,000 tons in Hungary. To the present total production of 1,910,000 metric tons, Austria contributes 1,434,000 metric tons, Hungary 450,000, and Bosnia 46,000.

It is interesting to note that during the last twenty-five years the world's production of pig iron increased in value from about 17000 million Austrian crowns to about 4800 million crowns, while the value of the production of gold rose from 510 million crowns to 1950 million crowns. The value of the pig iron produced represents at the present time about two and a half times the value of the output of gold.

*Paper read before the Iron and Steel Institute, September, 1907.

If Peter von Tunner, twenty-five years ago, rightly ascribed the advantages of the leading countries in the European iron industry as due to their abundance of mineral fuel, it may still be said that the progress of the Austrian iron industry would have been far greater if coke had been available in greater quantities.

The country, however, suffers from a scarcity of coking coal, and for this reason it has had to import coke from foreign countries, especially from Germany. In 1906 the production of coke in Austria was 1,700,000 metric tons, while for other countries the following returns are available:—

	Metric tons.
France (1906)	1,700,000
Russia (1906)	2,000,000
Belgium (1905)	2,200,000
Great Britain (1905)	18,300,000
Germany (1906)	20,300,000
United States (1905)	29,200,000

Austria-Hungary exports yearly about 300,000 metric tons and imports about 600,00 metric tons, so that the difference of 300,000 tons has to be obtained from abroad.

Austria-Hungary possesses several very rich deposits of iron ore, such, for instance, as the celebrated Styrian Ore Mountain. A more extensive smelting of the Austrian-Hungarian ores is hindered by the want of fuel, and for this reason Austria-Hungary at the present time is one of those countries which export iron ore.

The imports of iron ores amount yearly to 246,000 metric tons, and the quantity exported, to which Hungary contributes the largest share, amounts to 324,000 tons.

It can be taken as an axiom that the development of the iron industry of a country, in relation to the consumption, depends more on the richness of its fuel resources than on an abundance of iron ore. Thus it is seen that countries such as Sweden and Spain, which are rich in ore and poor in fuel, export the greater part of their output of ores to countries rich in fuel, and are, in proportion to their wealth in ore, only small producers of pige iron. Other countries, on the other hand, such as Great Britain, which depends to a large measure on the importation of iron ores, and Germany—which also has to import considerable quantities of ore—occupy a leading position. It is unnecessary to mention the happy United States, which rejoices in the possession of an abundance of ore and of coking coal, and for this reason naturally occupies the leading position.

The quantity and quality of the iron ores are as important a factor in commercial competition in the iron industry of a country as are the number and condition of the soldiers of an army; while the fuel resources are for the iron industry what the generalship and armament are for such an army. Under otherwise equal conditions the superiority in training and equipment of an army are more efficacious at the present time than mere weight of numbers. It therefore appears to me that the quality and quantity of fuel available are more decisive factors in the industrial development of the iron trade of a country than wealth of ores.

If I may further develop this comparison, it may be mentioned that the conditions of two combatants are also naturally influenced by other important circumstances, such as the existence of ramparts, or in other words, protective duties; further by the natural resources and financial wealth of the two competitors, which in the case under consideration is the demand of the home market. Finally, the fortune of ware depends on whether the forces are kept free from disease. Such diseases, mostly of a contagious character, are strikes, and the efforts of organizations to hinder production.

As an example, I believe that the development of the British iron trade would have been far more successful if the introduction of technical improvements had not been hindered by the action of trade organizations.

It must be specially remarked, with reference to the demand of the Austrian market, that there is great need of development, because large tracts of territory—not only in the mountainous Alpine districts, but also in the east of the Empire—are capable of a more intense productive activity.

It must be here mentioned that the yearly output in Austria of merchant iron is not more than 350,000 metric tons; 150,000 of girders, 70,000 of rails, and 65,000 of sheets.

The consumption of iron in any country obviously depends to a considerable extent on the population; and for this reason, in order to judge the figures given and particularly the amount of the production of pig iron of the several iron-producing countries, their populations are compared for the years 1882 and 1906:—

Population of Chief Iron-Producing Countries.

	1882.	1906.
United States	49,000,000	90,700,000
Germany	45,500,000	61,500,000
Great Britain	31,400,000	44,200,000
France	36,000,000	39,300,000
Russia	77,000,000	120,000,000
Austria-Hungary	42,700,000	49,100,000
Of this fell to		
Austria		27,300,000
Hungary		20,000,000
the Occupied Provinces		1,800,000
Belgium	5,900,000	7,300,000
Sweden		5,300,000
Spain		18,500,000

The yearly consumption in kilogrammes per head of the population, based on the production of pig iron, and also taking into consideration the export trade in machinery and in other iron ware for the various countries at the present time, may be taken as follows:—

	Kilogrammes.
United States	320
Great Britain	220
Belgium	160
Germany	145
France	65
Austria	50
Hungary	25
Russia	25

The measure of the industrial condition of a country depends less on the production of iron than on the production and consumption of fuel. The production of coal of the various countries for the year 1906 was as follows:—

		Metric tons.
United States		375,500,000
Germany		193,500,000
Including:		
Coal	137,100,000	
Brown coal	56,400,000	
Great Britain		255,000,000
France		34,300,000
Including:		
Coal	33,600,00	
Brown coal	700,000	
Russia		19,600,00
Austria		37,700,000
Including:		
Coal	13,500,000	
Brown coal	24,200,000	
Belgium		23,600,000

The yearly consumption of coal per head of the population in these various countries is given in kilogrammes in the following table:—

	Kilogrammes.
Great Britain	4680
United States	4050
Germany	3140
Belgium	2980
Austria	1370
France	1190

It may be remarked that the degree of general industrial activity of the countries named is proportional to the figures given for the consumption of coal, which agree, except for a few small differences, with the proportions given for the production of coal, calculated per head of the population. These figures therefore afford a measure of the economical conditions of the civilized countries mentioned.

With regard to the production of coal of Austria, it must be stated that the greater part of the output consists of brown coal, so that if the calorific value be taken into consideration, the production of coal of Austria can be approximately estimated as equal to that of France. The demand for coal in Austria-Hngary is not fully met by its own production, and at the present time about 7,500,000 metric tons of bituminous coal are imported, against an export of 8,1000,000 metric tons, of which, however, only about 900,000 metric tons are bituminous coal, and 7,200,000 metric tons are brown coal.

If not only the weight but also the calorific value be included in the calculation, the import exceeds the export in fuel value.

The prosperity of the Austrian iron industry is not only impaired by the want of mineral fuel, but also by the circumstance that it can only be brought to the principal producing works by costly methods of transport. The pig iron producing centres of Bohemia and Styria are situated in localities possessing rich supplies of iron ores, and have at their disposal, on the spot, extensive deposits of coal. They are, however, entirely without coking coal, and depend on the import of coke from the Mährisch-Ostrau, Prussian-Silesia, and Westphalian coal fields. The Ostrau pig iron producing centre, on the other hand, possesses an ample supply of coke, but has to obtain its ores chiefly from Hungary, which renders them expensive, owing to the high railway freight charges. The blast furnaces situated in the southern parts of the monarchy, like Bosnia, possess large deposits of ore, but mineral fuel is wanting. Throughout the whole of Austria there are no blast furnaces which have both ore and coke on the spot.

If, in spite of this want of mineral fuel, in spite of the circumstances conspiring to increase the cost of production, and that either the fuel or the ore can only be brought to the producing centres by costly routes, and in spite of the limited demand of an extensive portion of the Empire, the Austrian iron industry has been able during the last twenty-five years to keep pace relatively with the other iron-producing countries, this can be attributed to three reasons: firstly, to the sufficiency of the protective import duties, behind the wall of which a prosperous development of the iron industry has been possible; secondly, the association of the ironworks into a syndicate, whereby ruinous competition has been prevented; and thirdly, the concentration of the smaller works into larger units. By these two last mentioned means the adoption of more economical methods of working has been rendered possible.

The protective duties of several countries are given as follows, in order that the duties prevailing in Austria may be more clearly appreciated.

Duty Per Metric Ton in Crowns.

	United States.	Germany.	France.	Austria-Hungary.
Pig iron	19.4	11.7	14.3	15.0
Rough plates	54.4-108.8	58.5	71.4	90.0
Girders	54.4	29.3	47.6	70.0
Rails	38.1	29.3	57.1	60.0
Iron bars	65.3-87.0	29.3	47.6	60.0

Should any one feel astonished and filled with envy at the height of the duties protecting the Austrian iron industry, and at the high prices obtained in the country for iron manufactures, it must be remembered that a large share of the profit is absorbed by the State and other corporations, such as land, district, and Commune, in the form of taxes and rates.

As an illustration of this it may be instanced that the Prager Eisen-Industrie-Gesellschaft, together with the Böhmischen Montan-Gesellschaft, during the last eight years, a period contemporaneous with that of the application of the new taxes, paid to the State and to the other corporations mentioned 21,840,000 crowns, and to the shareholders 62,650,000 crowns, so that the former, which enjoy practically the position of preference shareholders without having had to provide any capital whateved, received more than one-fourth of the resulting profit, while on the other hand the real shareholders, who undertake the entire risk, received less than three-fourths. According to the peculiar construction of the rating law it has even happened that in one year the shareholders of the Prager Eisen-Industrie-Gesselschaft received in dividends 3,877,500 crowns, whilst the State and corporations received 4,116,107 crowns.

In this regard the Elysian fields must not be sought for in Austria, but are to be found in the United States, where the iron industry, working under the most favorable conditions both of production and protection by high duties, is so little liable to public taxation, that—according to authentic reports—a contractor, who in one year had obtained a net profit of 1,500,000 dollars, only had to pay 6,000 dollars in public taxes.

As a result of the import duties protecting the Austrian iron industry, Austria is completely closed to foreign iron; and thus we see that, whilst only twenty-five years ago a considerable proportion of the home consumption even for those manufactures in which high quality was imperative, had to be drawn from foreign countries, at the present time home products take their place.

Twenty-five years ago the inland railways purchased the greater part of the tires required, especially for passenger locomotives, in foreign countries; at present we find none but home manufactured tires in use. At that time in the workshops English tool steel was the most prized, but now it has been completely superseded by the highest qualities of steel made in Austrian steel works. Formerly the Austrian War Office purchased cannons, projectiles, and armour plates from the leading producers of foreign countries, and the warships of the monarchy were almost entirely built of foreign materials; at the present time home manufacturers of armour plates, of cannons, and of projectiles, whose products do not need to fear comparison with those of any other countries are available, and warships of the most modern construction, whose parts from keep to top-mast are manufactured in home workshops, navigate our seas.

Thus in the last twenty-five years Austria has made herself entirely independent of foreign countries, both as regards quantity and quality of the iron manufactures required in the country. The system of protective duties has therefore completely fulfilled its principal object.

During this period, as already mentioned, the Austrian iron industry has combined to form a syndicate, which embraces nearly all the branches of the iron trade. By this means it has been possible to utilize the ful ladvantages of protection, not only to protect the home market from foreign invasion, but also to obtain an opportunity in providing a share, if only a modest one, for the markets of the world.

How greatly the conditions in this respect have changed during the last twenty-five years can be best ascertained from the fact that in the year 1895 the imports of iron and of manufactures amounted to 230,000 metric tons, against an export of scarcely 40,000 metric tons, so that the imports exceeded the exports by over 190,000 metric tons. In the year 1906, 120,000 metric tons of iron and ironware were imported, against 240,000 metric tons exported, so that the difference in favor of the export was 120,000 metric tons.

In 1895, 174,000 metric tons of pig iron were imported, and only 9,000 metric tons were exported. Up to the year 1906 the import of pig iron declined to 62,000 metric tons, and the export increased to no less than 74,000 metric tons.

As already stated, the Austrian iron industry during the last ten years has welded together the smaller scattered ironworks into larger units in many cases, whereby, in combination with the division of production by the syndicate, the possibility of adopting more economical methods of working has been attained.

It is exactly twenty-five years ago that, to take an example, the Oesterreichische Alpine Montangesellschaft was formed from nine concerned, which then comprised thirty-three producing workshops, and produced yearly 165,000 metric tons of pig or and 620,000 metric tons of coal, and employed 17,500 men. The same concern produces at the present time 470,000 metric tons of pig iron and 1,200,000 metric tons of coal, and only employs 13,-400 men.

To what extent the conditions in Austria has rendered imperative the division of labor, made possible by the organization of the syndicate, and the concentration of the producing works, is best seen from the fact that the average annual output of girders in Austria during the last ten years was only 95,000 metric tons, and at the present time is not higher than 150,000 metric tons, in the production of which five works participate, or that the demand of the Austrian railways for rails amounted during the last ten years to an annual average of not more than 80,000 metric tons, and at the present time this quantity is not exceeded. The production of this small quantity is also divided amongst five ironworks.

Theorists express the opinion that protective duties and trade syndicates hamper technical progress, because they put into the pockets of those interested abundant profits without any trouble. Opposed to this view, the Austrian iron industry can with pride point out convincingly that such a theory is devoid of foundation, because they are always endeavoring to improve their works technically. The Austrian ironworks have utilized all the modern methods for economical working, although they have been naturally limited, because their plant and appliances require to be fitted to a great variety of manufactures, and must be designed to suit the proportionately small consumption of the country.

The Austrian iron industry has therefore to avoid mere slavish imitation of the gigantic works in the United States, and has modified methods to suit the given conditions.

It is quite a different thing to erect a rail rolling mill, which has a yearly production of 800,000 metric tons, as is done in the United States, and, as is the case in this country, to arrange that five ironworks shall share between them one-tenth of this production, and at the same time be forced to produce rails, girders, sleepers, and similar material in one and the same mill. Though the Austrian ironworks endeavor to render serviceable all appliances which are intended to effect a saving of manual labor, yet they are not in many cases urged so far in this direction as the American works, which are guided by the scarcity of workers and the high rate of wages. Whilst in that country the demand for labor is met by immigration, a mighty living stream flows from our monarchy, especially from the other half, Hungary, where the emigration is facilitated, by the Government; and it is greatly to be regretted that our Empire stands at the head of those countries which provide the rest of the world with workers. During the year ending with the 30th of June, 1906, the number of emigrants amounted to 265,000, of whom 153,000 came from Hungary. During the month of March of this year alone 43,000 persons emigrated from Austria-Hungary to the United States, of whom 27,400 were Hungarians. With these figures our monarchy even surpasses Italy, which up to recent times had furnished the largest contingent of emigrants.

If then you consider the various centres of production of the Austrian iron industry, you must, in forming opinions as to whether the plant and the improvements adopted represent the most modern requirements or not, continually keep before you the conditions depicted, and especially consider that the consumption of iron is very limited, that a production of large quantities, attainable by the most intense specialization, as is to be found in the United States, in Great Britain, and Germany, appears to be out of the question, and that the Austrian ironworks are obliged to divide their proportionately small productions into a considerable number of different manufactures.

Taking into consideration all the local conditions, the Austrian ironworks believe that they have done the best possible to them with regard to technical progress, and await your judgments with tranquility.

You will find that, where the conditions exist for a larger production of pig iron, at the Oesterreischische Alpinen Montangesellschaft, and also in Witkowitz, blast furnaces, with a daily production up to 450 tons, equipped with all the most modern appliances, such as automatic charging apparatus. You will find the most complete utilization of blast furnace gases, as, for example, in the Königshof ironworks of the Böhmischen Montan-Gesellschaft, where blast furnace gas engines of more than 6,000 horse-power are installed, by which not only the blowing engines but also the rolling mill for rolling sheets (the most important in the monarchy) are wholly driven. You will be able to observe the greatest possible utilization of other by-products of the blast furnaces and steel works; you will find the slags rich in phosphorus in Kladno and Königshof converted into artificial manure; at Witkowitz, Kladno, and Königshof the blast furnace slags are manufactured into slag bricks and slag cement, and the slag cement works at Königshof are the largest of the kind on the continent.

You will find everywhere the most extensive application of electricity, mostly in conjunction with blast furnace gas engines, and also coke ove ngas engines for the generation of power, and, as an example, in Witkowitz a plant of this description of 5,700 horse-power exists.

It should here be noted that at the Austrian blast furnaces which yield 790,000 cubic metres of gas per hour, 263,000 cubic metres are used for blast heating, so that 527,000 cubic metres are available. Of this quantity, at the present time 358,000 cubic metres, or 68 per cent., are utilized for boiler heating, and 34,000 cubic metres, or 6.5 per cent., representing 12,000 horse-power, in gas engines, whilst the remainder of the gas is used partly for ore roasting or in drying kilns, and partly drawn off unutilized. The Böhmische Montan-Gesellschaft, which at present is utilizing blast furnace waste gases on the most extensive scale, utilizes 23 per cent. of the available gas in gas engines.

In the Austrian coke works, the coke ovens yield 86,000 cubic metres of gas per hour, of which quantity the coke ovens themselves absorb 62,000 cubic metres, so that 24,000 cubic metres are available. Of this quantity 5,700 cubic metres, or 24 per cent., are utilized in gas engines, whilst the remainder is used for boiler heating.

The most complete application of electricity to the driving of rolling mills will be shown to you in Teschen, where, as is well-known, not only the finishing, intermediate and roughing trains, but also the reversing rolling mills, are driven by electric motors. It must be recorded that as early as 1897 in Servola, Triests, the Krainische Industrie-Gesellschaft at their blast furnace plant installed an electric ship loading crane, on the American Brown system, to serve a blast furnace with daily output of 250 tons.

It will also be brought to your notice that the Austrian steel works engaged in the manufacture of alloy steels of great value, especially tool steel, have also lately adopted the new electric processes.

Thus we find that the Poldihütte have adopted the Kjellin process, the firm Gebrüder Bohler & Company are introducing the Ch. A. Keller electric arc process, and the new Styrian cast steel works of Danner & Company employ the Héroult process; the Kärntnerische Eisen- und Stahlwerks-Gesellschaft have also decided to adopt the Héroult process at their works in Ferlach.

You will find many other things which will repay your attention, and will show you that the Austrian producers of iron have spared no trouble to maintain the position of their works at a high degree of technical equipment. It must, however, be repeatedly remarked that the Austrian ironworks can never neglect existing conditions, and I must ask you when judging our plants to continually bear in mind the special conditions, which are that the Austrian iron industry does not possess sufficient coke, that it must be brought from great distances, at a great expense, to where the ore is found, or the reverse, that the ore must be transported in a similar costly manner to the coke ovens, and that the output which the home market requires is proportionately small, so that manufacture in bulk and a specialization of the rolling mill equipment appears to be entirely out of the question.

The lack of specialization in many cases prevents an extreme supersession of manual labor and the application of arrangements to attain this object, which appears to be less necessary in Austria than in those countries where wages are high and where the necessary labor is wanting.

If, in the description given above of the Austrian iron industry of twenty-five years ago, you may seem to detect some note of quiet resignation, so I believe that industry looks forward to further future extentions with hopeful confidence, the more because I believe in the prediction, which the past-president of the Iron and Steel Institute, Mr. R. A. Hadfield, made in his brilliant address in the year 1905-1906, that within a measurable time the world's production of iron, owing to the lack of iron ore, will be unable to satisfy the demand. Mr. Hadfield gives the amount of iron ore in sight at 10,000,000,000 tons, a supply which, at the rate of consumption observed during the last twenty-five years, would be exhausted in about forty years. There is no danger that in forty years the world will suddenly be without iron, for the discovery may confidently be expected of many, at present unknown, deposits of iron ore in the undeveloped districts of Eastern Asia and Africa; it is, however, certain that the increase in production of pig iron must attain a limit within a measurable distance of time.

These conditions may similarly be experinced in Austria at a not very distant date. If you will allow again twenty-five years to elapse before your next visit, which I am far from wishing, then many important deposits of ore in Austria and Hungary will be exhausted, for instance those Bohemian deposits of ore which the blast furnaces of the district charge together with ores rich in phosphorus, so that they will be obliged to fall back to other existing deposits, which, owing to their low percentage of iron and high percentage of silicon, cannot at the present time be smelted with economy. In the south of the monarchy, in Bosnia, there are still undisturbed deposits of ore, and the Styrian mountain of ore certainly represents an almost inexhaustible source of supply, but all these auxiliary sources can only serve to keep the Austrian iron industry at a certain level, without rendering any considerable rate of increase possible.

On the other hand, the consumption of iron increases progressively, so that I consider that the time is not very remote when the Austrian iron industry must renounce its share of the supply of the world's market, while afterwards—according to my opinion after scarcely twenty-five years—foreign iron will be imported to satisfy the demands of the home market.

If the producers of iron of the rest of the world in the coming, as in the past quarter of a century, should so considerably enlarge their homes and build up palaces, Austrian ironmasters must moderate their pretensions and keep their dwellings within modest dimensions. They will, however, at all times endeavor to keep them swept and garnished, so that all who dwell in palaces can nevertheless at all times enter them with pleasure, and they themselves will take no less pride in their homes than the dwellers in palaces.

A very minute amount of cobalt as chloride or sulphate, when added to a large excess of boiling strong solution of potassium hydrate or sodium hydrate gives a blue color which is destroyed by dilution. Nickel salts in larger proportion give a blue of different quality, which becomes reddish when heated.

The alumina contaminating the silica left by the ordinary evaporating to dryness with hydrochloric acid, can be rendered soluble in hot hydrochloric acid by igniting the precipitate for two or three minutes. If the ignition is too intense or too prolonged the alumina becomes again insoluble.

A NEW BLUE-BLACK IRON PAINT AS A PROTECTIVE COVERING*

By F. J. R. Carulla (Derby.)

In the preparation of iron and steel rods for wire drawing and galvanizing, as also in the preparation of plants for tinning, etc., the iron is kept for a time in a bath of acid to remove the scale. The acid used may be sulphuric acid, when a solution of sulphate of iron ("copperas") is produced; or hydrochloric acid may be employed, when a solution of chloride of iron is obtained.

A number of methods have been devised to utilize these solutions, and it is the object of this paper to bring before you the one which appears to be the most valuable when chloride liquors have to be dealt with.

The acids named are not absolutely neutralized by the use that they are put to, so that the liquors are still active and have to be "killed" before they are subjected to any operation for the recovery of the iron and of the acid in any form.

The sulphate "waste pickle" liquors, as they are termed, are killed or neutralized by the addition of scrap, producing a neutral solution from which copperas in the solid form is obtained, these liquors being one of the main sources of this material. When hydrochloric acid is employed ferrous chloride is produced, which is not so tractable a salt as the sulphate, owing to its great solubility; and, besides, the demand for it is insignificant when compared with that for sulphate.

The chloride liquors are consequently generally dealt with by adding some base, which, combining with the chlorine, will precipitate the iron as an oxide, and that which naturally suggests itself is lime. This has been employed; but the calcium chloride produced being also a very soluble and deliquescent substance with little use for it, the process can only be resorted to as a necessity. Certainly the calcium chloride solution might be run away, but a better use might be to employ it for watering roads and preventing the dust arising from the passage of motor cars, a use to which this salt is said to have been successfully applied. Potash and soda have also been suggested and employed as bases for the precipitation of the oxide of iron, but the product obtained has obviously a value much below that of the materials employed. To turn caustic soda into common salt cannot be a very profitable process, nor yet to use potash and obtain chloride of potassium.

The idea occurred to Dr. C. F. Wülffing, for some time a resident in the Swansea tinplate district, that ammonia might be employed to effect the precipitation in question, seeing that the value of the ammonium chloride is greater than that of the ammonia employed.

The great drawback to such a process naturally is that the volatile nature of ammonia requires special attention to be given to the apparatus employed, which must necessarily be closed, and every possible means of escape of the amonia prevented. Especially is this the case as the liquor has to be blown for a considerable period in the presence of ammonia, some of which the air carries off, and provision has to be made in the plant not to lose this ammonia.

The necessity for this blowing or oxidation arises from the fact that Dr. Wülffing's main object is to obtain a black oxide of iron, which is only produced after long exposure to the air blast. This oxide, which is obtained as a beautiful blue-black color, is quite insoluble in water, and when passed into the filter pres sleaves a clear solution of ammonium chloride which is evaporated and allowed to crystallize.

The blue-black precipitate is magnetic, showing it to be Fe_3O_4, and is a valuable addition to the list of pigments that can be employed with advantage for the protection of structural ironwork.

By similarly treating the chloride liquors with other bases a black color can be obtained, but it is not of the extreme fineness possessed by the substance when ammonia is employed. It is also necessary to consider that absolute chemical purity is unattainable whatever method may be employed. If the process be attempted with lime, some of this, which is a most undesirable impurity, remains behind, the color produced being, besides, of a poor quality. With ammonia, on the other hand, the black oxide is left with a trace of a double salt, which Dr. Wülffing regards as NH_4Cl, $FeCl_2$. This acts beneficially on the paint, although ammonium chloride by itself would not do so. Structures that have been painted with this blue-black oxide of iron (boiled linseed oil being used in the preparation of the paint) have kept fresh though exposed to the weather for nearly two years, still showing a varnish-like surface.

The Sharon Chemical Company, Limited, to whom Dr. Wülffing has assigned the English patent, are putting up a plant in Derby which will probably be working when this paper is read. The writer may avail himself of the opportunity granted to authors to make a more or less lengthy addition to this note should occasion arise after the plant is started.

*Paper read before the Iron and Steel Institute, September, 1907.

EXCHANGES

Mines and Minerals, September, has a paper on "Montana Gypsum Deposits." The refined gypsum products sell for about $8 per ton. From analyses quoted, Montana gypsum appears to be of exceptional purity.

The Mining and Scientific Press, September 14th, refers in its editorial columns to Mr. J. J. Hill's control of the Crow's Nest Pass mines. It makes the sweeping statement that Mr. Hill has the coking of coal of the Northwest under his thumb.

The Iron and Coal Trades Review, August 30th, contains an article on "The Housing of Workmen." The writer attributes to Germany the credit for originating most of the devices for improving the conditions of workshops. However this may be, there is a decided improvement in the style and comfort of modern English workmen's dwellings. The Brodsworth Main Coal Company, operating near Doncaster, recently offered a prize of £100 for the best design of a model village, consisting of 500 cottages, club house and shops, to cover an estate of 70 acres.

The Iron and Coal Trades Review's (September 6th) remarks on coal conditions and prices are timely. It is pointed out that the coal owners are not, as such, responsible for either the rise or the fall of prices. It is entirely a question of the "higgling of the market." For two years the demand for coal has been increasing in excess of the increase of supply. No coal owner can make the public purchase an ounce more coal than they want, nor an ounce less. The coal trade has many allied interests, and one of these—the great railway carrying interest—as we have pointed out in one or two recent issues, is taking care to secure as large a slice as possible of the higher prices that are being paid for coal.

BOOK REVIEWS

THE MANUFACTURE AND PROPERTIES OF IRON AND STEEL, BY HARRY HUSE CAMPBELL, FOURTH EDITION, FULLY REVISED; THE HILL PUBLISHING COMPANY, 505 PEARL STREET, NEW YORK; 640 PAGES, ILLUSTRATED. PRICE $5.00.

When, half a dozen years ago, the first edition of the "Manufacture and Properties of Iron and Steel" appeared, it was at once recognized as a standard. The fourth edition brings us a book different in many minor respects from the first, but retaining in perhaps more convenient shape all the marrow of the preceding edition. "By constant additions," the author prefatorily remarks, "the book had grown too big to be convenient, so that every line has been gone over to eliminate unnecessary phrases or words . . . On the other hand, much new matter has been added . . ."

The fourth edition has a number of pages less by 222 than the second edition. But the loss in bulk is amply compensated for by the added compactness and by the absence of matter of only temporary value.

Part I., as an introduction to the main principles of the metallurgy of iron, serves its purpose thoroughly.

That section of Part II. which describes the blast furnace is carefully written. A startling amount of information is compressed within its forty-seven pages. As this, to the young metallurgist, is one of the most important chapters, its value would have been increased had it included a simple method for calculating blast furnace burdens. However, as it stands, this chapter is wonderfully profitable reading. The author, being himself pre-eminent among American steel metallurgists, has been able to use much tabulated data, derived from experiments at his own works at Steelton, Pa. And the reader is at once impressed with the fact that Mr. Campbell is writing with a "first-hand" knowledge of his subject.

Most instructive is Part III., wherein are collected short sketches of the iron industries of the leading nations of the world. Again the reader has the benefit, to a certain extent, of the author's personal acquaintance with the foremost ironmasters of Europe and with many of the industrial centres referred to.

Regarded as a general text-book of the iron and allied industries, this volume stands unapproached by any book that we know of. The task of covering so much ground in such limited space is a Herculean one. The very need of such careful condensation points to the opposite need. Mr. Campbell's excellent book might well be supplemented by a series of books taking up each chapter, in regular order, and expanding upon each. The technical world, incidentally, is in particular need of practical books upon such subjects as the blast furnace and coal-washing.

CHEMICAL REAGENTS—THEIR PURITY AND TESTS. A NEW AND IMPROVED TEXT-BOOK, BASED ON AND REPLACING THE LATEST EDITION OF KRAUCH'S "DIE PRÜFUNG DER CHEMISCHEN REAGENTIEN AUF REINHEIT." BY E. MERCK. AUTHORIZED TRANSLATION BY HENRY SCHENCK, A.B., (HARVARD). D. VAN NOSTRAND COMPANY, 23 MURRAY STREET, NEW YORK, 1907, VIX., 250 pp. PRICE $1.50.

A convenient hand-book on the testing of chemical reagents has long been needed. Chemists, employed in industrial laboratories, are too prone to accept the label of the manufacturer as a guarantee of purity. And, even when they begin to suspect the absolute freedom of reagents from contaminants, they are often at a loss to apply tests at once rapid and complete. Not infrequently the inexperienced chemist does not know what impurities to search for in each reagent, and he must perforce exhaust a great many possibilities before he finds what he is looking for. Time is money in modern laboratories. Therefore any hand-book which is devised to save time for worthier objects is acceptable.

The book before us is evidently the product of a long experience. All of the principal reagents, inorganic and organic, are included in alphabetical order. Tests are given for the typical impurities of each and the distinguishing chemical and physical qualities of each are enumerated. An excerpt will illustrate the arrangement followed. Opening the book at random we come upon a paragraph headed "Bromine Water," which reads thus:—

BROMINE WATER.

A saturated, aqueous solution, containing about 3 per cent. of Br.

Tests of Purity.

Sulphuric Acid.—Add 0.5 c.c. of hydrochloric acid and barium chloride solution to 50 c.c. of bromine water, and boil the liquid until the bromine has been completely expelled from it. The precipitate of barium sulphate should separate on standing one hour.

Bromine Content.—Let 10 c.c. of bromine water run into a solution of 5 grammes of potassium iodide in 100 c.c. of water, allow to stand half an hour in a stoppered flask, and then titrate with decinormal sodium thiosulphate solution. 1 c.c. of decinormal $Na_2 S_2 O_3$=0.007996 gramme of Br., log. 90287.

Thus a ready method for testing for the chief impurity of bromine water is described, along with a determination of the strength of the reagent. The knowledge of these methods and the use of them will not only give the chemist confidence in his work, but will make for economy. Bromine water is a reagent which the chemist is apt to use far too liberally, thereby wasting material and much time. When the strength of reagents is definitely known it is possible to regulate quantities so as to effect a great saving of time in boiling and evaporation. Moreover, anything that tends to a strict standardization of chemical methods tends also to eliminate error and sloppiness.

Tables of atomic weights, corrected up to 1906, and of normal and decinormal solution equivalent are given on the last pages. An index is also included.

PERSONAL AND GENERAL

Mr. Alex. Longwell, of the Coniagas Mine, has taken a residence in Toronto for the winter.

Mr. Graham Fraser has recently visited Victoria and other points in British Columbia.

Mr. W. K. MacNeil, M.A., has returned to Cobalt after a few weeks' holidays. Mr. MacNeil has charge of the laboratories of Evans & Laidlaw.

A Prospectors' and Mineral Interests' Exchange has been organized in New Liskeard. The object of the organization is to protect the interests of buyers and sellers of mining claims. The membership fee is five dollars. One of he objects of the exchange will also be the elimination of middlemen's profits and of brokers' options. J. R. Lawless, New Liskeard, is president, and V. E. Taplin, of the same place, is secretary.

CORRESPONDENCE

Klondike—Cobalt.

To the Editor, CANADIAN MINING JOURNAL:—

I can still remember the fierce outcry in the Klondike district against the imposition of any royalty on gold mined there. The leaders in this opposition to the tax were Conservatives. It was therefore amusing and instructive to me to see the Conservative Government of Ontario impose a royalty on Cobalt silver, and to note the strong objections on the part of the Cobalters.

The imposition of this tax in Klondike and in Cobalt was due in a great measure to the boasts and to exhibitions of vast wealth by the owners of mines themselves. It is only necessary to say that Mr. Wm. Ogilvie did not even recommend the imposition of any tax (although blamed for it); the Government at Ottawa saw to that. In a like manner we may be sure that it was the Government at Toronto which moved, with reference to Cobalt. And each Government was and is right in doing so. As the only Canadian editor in Dawson for years, I bore the brunt of the defence of the royalty, and I have had no reason to change my mind. More especially as the Dominion Government protected the poorer miners by exempting productions of $5,000 and under, yearly. The royalty on the mine's production was, under pressure, modified to a general export tax of 2 1-2 per cent. on all gold exported from Yukon territory, and there it remains.

But the anti-royalty cry hurt the Government very much in Yukon, and the tax was denounced as "un-British" by its opponents. As a matter of course the product of many of the richest mines in the Klondike went into alien hands, and was taken out of Canada. Again other vast sums went into the hands of blackguards, gamblers, prostitutes and such; and the man who vehemently denounced the tax would in many cases throw away ten times the amount on wine, women and gambling. It was also useless to point out that British Columbia imposed a mineral tax.

It must be kept in mind that while an agricultural country goes on forever, a mineral country has only a limited life, especially where the deposits are of great richness. But when the population dwindles in sympathy with the decrease in production, the Government must continue, schools, public buildings, roads, law and order must be maintained from an insufficient revenue.

The Dominion Government has spent about all the revenue from Yukon in roads, public buildings, telegraph lines, police protection and such. In the matter of roads the chief blame was that their construction was not started earlier; but although tardy in beginning, the Government has (according to the evidence of the United States Senatorial party who visited Yukon and Alaska) redeemed itself with great credit. Let us hope the Ontario Government will do as well; and being so much nearer the field, it may not delay the construction of roads. The law and order enforced in Yukon has been pointed to with pride, and is a vivid contrast with that now maintained in the Western States and Alaskan mining camps.

Let me suggest two ways in which a portion of the fund collected from the tax on silver may be used to best advantage. First, by generous rewards to persistent, as well as to successful prospectors. There is where every Province in Canada fails miserably, and it is one of the keys to success in developing mineral wealth. And in addition to these rewards, life annuities should be granted to hard-working, persistent and intelligent prospectors whose good work is apparent, even although they may make no big discoveries themselves. In the Klondike it was the determined and intelligent prospector who although he found the wealth, did not participate in it, while the man who was not even a prospector stumbled on a small, but the richest part, of the gold fields, and made a fortune. The majority of successful pioneers and prospectors are financially improvident, and are utterly careless of old age provision. They are generous, and even if they profit by their discoveries, the proceeds slip through their fingers. Again, as in Robert Henderson's case, when he had outlined and discovered both the Indian River and Klondike gold fields, he was, by a quibble in terms at the recording office, deprived of his well-earned wealth. The fact that the Government acknowledged its mistake years after has not been of any benefit or a real reward. It is perhaps on a par with the grim irony of a Province voting a tardy little annuity to the dying daughter of a long dead discoverer; neither of whom profited by that discovery.

Secondly, the establishment of good homes for aged and disabled prospectors and miners, as in British Columbia. When a pioneer or prospector feels assured that he will not have to end his career in abject poverty, or by the leaden route, he can and will cheerfully devote the best years of his life, and all the vim of youth and middle age to his valuable work for the Province, and for Canada.

The matter in the above letter was written six months ago, but it was declined then by leading Ontario journals. It may be of interest to a mining journal which does credit to Canada.

Yours,

HENRY J. WOODSIDE.

Ottawa, 16th Sept., 1907.

To the Editor, CANADIAN MINING JOURNAL:—

I noticed an article on "Springhill and its Collieries," by W. D. Matthews, in your issue of 15th Sept. In this Mr. Matthews states: "It is generally conceded, however, that the Cumberland Railway & Coal Company has the best of it. Outside of their holdings it is doubtful if the remainder possess any great value."

I wish to contradict this statement. The Springhill seams are certainly among the best and thickest at the present time, but to claim them as being the only valuable seams in Cumberland County is, to say the least of it, presumptous. How can Mr. Matthews claim exclusive value for their holdings, which in many instances are either sandwiched in between or in close proximity to holdings in active operation by other company, and whose seams are just as good in quality, if not better, than those at Springhill. Furthermore, I was not aware that a coal basin existed at Springhill. I was always under the impression, and am still, that they are part and parcel of the Cumberland coal basin and on an equal footing, in this respect, with the rest of the mines whose good fortune it is to be operating in this large and valuable coal field.

Trusting you will give this space in your valuable JOURNAL, and with apologies, I am yours very truly,

ROBT. ARCHIBALD.

Eastern Coal Company, Maccan, N.S.

Mr. H. E. T. Haultain passed through Toronto on September 20th, having completed a tour of certain American centres in the interests of the Canada Corundum Company, of which Mr. Haultain is the general manager. Mr. Haultain visited consumers of corundum in Wisconsin, Illinois, Indiana, Kentucky and Tennessee.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.—Glace Bay has been more or less *en fete* during the past week in honor of the visit of the National Trades and Labor Congress of Canada, at the invitation of the Provincial Workmen's Association. To welcome, and incidentally to impress the visiting delegates the P. W. A. arranged a rather interesting parade, which was held on the evening of the 10th. The various P. W. A. lodges turned out in force, and all the "boys" of the Coal Company's fire brigades were there in blue and white. About three hundred of the miners in the parade carried lighted safety lamps, which must be growing in favor. Two large floats carried enormous blocks of coal, at which two men worked, one with handpick and the other with machine-pick, to show the old way and the new, a la the Ingersoll advertisement. One of the leading spirits of Ironside Lodge wore the Draeger breathing apparatus, and seemed to enjoy himself. We hardly understand, however, why he chose to ride, and he looked an odd "rescuer" sitting in in a carriage! The new town fire engine, the "John Leaman," was there under a full head of steam, with a mine tub full of coal in its immediate rear. The coal was No. 6, guaranteed the genuine article, and the fire engine bore the legend: "Modern fire engine, burning No. 6 coal!" This was a somewhat significant item of the procession, as showing the temper of our Glace Bay people in the matter of the aspersions that have been cast upon the fair name of their coal seams, and we think it was rather a sly dig at a neighboring city that piques itself upon its fire brigade. The parade was a most unqualified success, and was witnessed by a well-dressed and orderly crowd of about fifteen thousand people. Such a gathering points to a growing spirit of local patriotism and pride in our mining industry that augurs well for the district as a whole, for, split up into hostile camps as we are by race and sects and politics, it is not often that a united and general effort is so enthusiastically carried out.

Most of the visiting delegates spoke the French language only, and the proceedings of the conference were carried on in both French and English, with asides in Gaelic we are told. One of the merchants in town displayed two greetings. One read: "Comment ca va" and the other ran "Camar ha sibh dhu." Such a juxtaposition of the language of courts and diplomacy with that primeval tongue that lingers in Cape Breton arouses a train of thought that leads one far afield from the dust and grime of our collieries to the old-time friendship of Scotland and France before Louisburg fell and the Bastile became a tradition. It is a far cry from the court of St. Louis to the Glace Bay Hotel, and one would hardly think there was any of the glamour of romance and history about a P. W. A. gathering in Glace Bay. Yet there is. This island is rich in historical tradition and in an old world tongue and literature that carries us back to Fingal and Ossian and the mists of Gaelic tradition. We wonder why the young Cape Bretonian is ashamed of his Gaelic speech. He has no reason to be, and there are many reasons why he should be proud of the fact. The Welsh miner does not speak the tongue of the Sassenach, nor does the French-Canadian. But to be practical, we understand that the P. W. A. intend to affiliate with the Upper Canadian organization before referred to. Well, stranger things have happened.

The P. W. A. will hold its Grand Council meeting at Halifax on the 17th. There are several things for them to discuss. The three years' agreement with the Dominion Coal Company expires at the end of this year, and it will in all probability be renewed. The agreement has worked well, and save the stoppage of No. 1 on the question of working with non-unionists, there has been no hitch in the relations of the Coal Company with their men since the contract was signed.

The Grand Council of the P. W. A. will also, we understand, take up the question of old age pensions for miners. The Nova Scotia Legislature at their last session appointed a committee to "examine into and advise upon the advisability of adopting some scheme of providing old age pensions for workmen, and particularly for such workmen as have either by themselves or in conjunction with their employes, established benefit or relief societies, etc." The Commission will sit in Glace Bay on the 25th inst. to take evidence and examine witnesses. It is composed as follows: Chairman, Walter Crowe, barrister, of Sydney; Hon. Robt. Drummond, of the *Mining Record*; Stephen B. McNeil, Grand Master of the P. W. A., and Wm. Hodge, of Springhill. It will be seen that the Commission is a very representative one. We commend to the Commission a careful study of the constitution of the Provident Society known as the Knappschafts-Verein in the collieries of Westphalia in Germany. Under the German law membership in this organization is compulsory upon all mine employes. The funds are contributed in the proportion of one-third each by the Government, the workpeople and the employers, and the benefits are sick relief, death bounties and old age pensions.

The output of the Dominion Coal Company for the first fortnight of September is small, owing to the fact that it contains three Sundays and Labor Day, but during the latter half of the month its is expected to materially increase. The labor conditions are improved, and from now to the close of navigation the output will reach 15,000 tons a day or thereabout.

During August the shipments were very large, being over 365,000 tons for the month. The huge banks that were accumulated last winter have practically disappeared.

The reconstruction work at the Hub Mine is now practically completed, and everything is ready to hoist coal. It is not probable, however, that any great amount of work will be done this season owing to the scarcity of labor. It is the intention of the management to install a modern electrical endless haulage system at once, and when the Hub begins to hoist coal again it is expected to obtain well over the thousand tons per day. No person looking at the modern layout of the Hub Mine to-day would recognize the smoking chasm which was all that was left by the fire last December.

The Coal Company are advertising for tenders for the construction of seven miles of railway to connect their Sydney and Louisburg line with their proposed new colliery at Barrachois, and it is said that considerable developments are contemplated in that neighborhood. As yet, however, the Coal Company have not made any statement to this effect.

We understand that considerable developments are expected at the old Gowrie mines at Port Morien. Mr. B. F. Pearson, of Halifax, accompanied by Dr. J. A. Henderson, of London, Eng., visited the colliery on the 7th inst. and inspected the plant. Mr. Nicholas Richardson, of Newcastle, England, is the newly appointed manager, and under his supervision the management are installing additional boiler power, new hoisting engine, etc. For some time past the mine has been practically idle, only enough coal being hoisted to keep the pumps going, and the promise of new for the old mine is welcome to the Port Morien people.

ONTARIO.

BRUCE MINES.—The party of British journalists who, at the invitation of the Ontario Government, whose guests they now are, crossed the Atlantic on the Lusitania, visited Bruce Mines on September 18th under the guidance of the Hon. Frank Cochrane. The party numbered sixteen, all representatives of leading English journals.

They were met at the station by Mayor Knight and a company of leading citizens. A breakfast was served at the Exchange Hotel, at which speeches were made by the hosts and responded to by the vsiitors. Mr. T. Hayes-Sheen occupied the chair. His

address was a strong presentation of the advantages and claims of Bruce Mines. He referred to the indefatigable efforts of the Hon. Mr. Cochrane in advancing the mining interests of Ontario, and, also, to the good work done by Mr. W. R. Smythe, the local member. With Mr. Cochrane's consent Mr. Hayes-Sheen announced that, under the auspices of the Local Government, a preliminary survey was being made to define a railway route to connect Bruce Mines with the C. P. R. main line..

This line, later on, is to be projected northwards towards James Bay.

The Hon. Mr. Frank Cochrane spoke briefly of the desire of his Government to further the development of the vast natural resources of Northern Ontario.

Both Mayor Knight and Mr. W. R. Smythe made short speeches.

Representatives of the *Morning Post,* the *Tribune* and the *Standard* made happy responses.

After breakfast the visitors were shown over the Bruce Mines plant.

BRITISH COLUMBIA.

THE KOOTENAYS.—The coke question still remains an ardent issue in this district. While there has been more or less improvement in the situation during the past two weeks, a majority of the smelters are running "from car to furnace," and if there should be any marked interruption in the scant supply it would undoubtedly mean the closing of some of the plants. Nothing has been heard of Mr. Tolmie's findings, although he has gone thoroughly over the ground. However, it is hoped that fuel conditions will steadily improve, and that the various mining and smelting concerns will have a bounteous supply of fuel stored in their bins as a reserve before old Boreas puts in his appearance and renders transportation a problematical matter.

Shipments from Rossland camp are necessarilyq still curtailed. Le Roi Mine is on the shipping list again and are shipping 1,500 to 2,000 tons per week. Consolidated properties are shipping from 2,500 to 3,000 tons per week. Le Roi 2, Limited, are shipping several hundred tons per week. The lessees of the Nest Egg have shipped two cars of ore and have realized a profit from the same far in excess of their expectations. The White Bear Mine shipped three car loads of ore, about 105 tons, and a car of concentrates, during the week just ended. The concentrates represent 350 tons of second-class ore milled. It is pleasing to learn that this property is now paying its own way and returning a small sum each month to its treasury.

Hearsay has it that A. I. Goodell, of the Northport smelter, has handed his resignation to Le Roi management. Mr. A. G. Larson, superintendent of the mine, has gone south on a holiday for a month, but it is said that he has been proffered a couple of choice positions and, owing to some little friction in Le Roi affairs, may accept one of the offers made. It is too bad that a meritorious concern like Le Roi should be continually laboring along under a load of trouble. The mine pays liberal tribute to those who hold the reins of its government and still seems to be almost powerless to unburden itself; at least to any considerable degree. The management of this concern no doubt will have to exercise a sane and far-seeing policy if they would lighten this load and divert part of the revenue from the property to the purses of the shareholders.

At Northport there are three furnaces being operated in the smelter. Trail smelter is running at about half capacity, principally owing to the scarcity of fuel. The Boundary smelters are all running along fairly well, with the exception of the plant of the British Columbia Copper Company, which was a little short of fuel last week. Nothing of signal interest developed in the Boundary mines since last writing. As with the Rossland mines, the usual development work and shipping was done, as well as possible, under existing conditions.

The shareholders in this country have just received their cheques for the British Columbia Copper Company's last dividend. The Granby has just declared another dividend of $405,000. These, with the Consolidated making regular divisions of profit quarterly, and other propositions showing up on the list from time to time, place this district in a far better position, from the investor's point of view, than that which it occupied a few years ago.

Railway construction is active in the Boundary and Similkameen districts. They will have excellent transportation facilities in that section in the very near future.

At last it is authentically stated that J. J. Hill and Great Northern interests have acquired a large interest in the Crow's Nest Pass Coal Company, and that the Granby Company have invested about $700,000 in Crow's Nest stock. There are rumors of changes in the mine management, many denials from various quarters, but the suggested changes would be welcome to the interests in this country if a sufficient supply of fuel would be the result.

Naturally, the prevalent agitation against Asiatic labor is a question of importance and interest to the people here. Several organizations have passed resolutions condemning the uncontrolled admission of Oriental laborers to Canada, and British Columbians generally are vehement in the stand they take against the Asiatic hordes being allowed to swarm over this country. It is contended that there is no justice in permitting the Oriental to despoil the future, as well as the living, white race of the opportunities and prerogatives that are theirs by birth and education. Without actually going through the experience, it is almost safe to say that the admission of thousands upon thousand of Asiatics would have a pernicious effect upon the white laboring class, of a few decades hence more particularly. While the rioting at Vancouver is not countenanced by the every day law-abiding individual, it is hoped by all that the affair will serve to culminate this matter and that a decisive move will now be made by the Government towards a settlement.

GENERAL MINING NEWS

NOVA SCOTIA.

LONDONDERRY.—The blast furnace of the Londonderry Iron & Mining Company was blown in on September 7th. The furnace has been partially relined under the direction of William Scurrah. During the last three months the entire plant of the Iron Company has been put in excellent shape. The "blowing-in" was an event of great local importance.

HALIFAX.—The Provincial Workmen's Association has emphatically protested against the Industrial Disputes Act. The objections raised are based upon three points:—1st, That much delay is experienced in putting the Act into operation; 2nd, that witnesses summoned before the Board do not receive sufficient remuneration, 60 cents per day being the fee paid; 3rd, that the advice of the P. W. A., as a body, had not been asked. The organization is also taking up the matter of the low wages paid to outside laborers at the mines.

PORT MORIEN.—It is expected that the North Atlantic Collieries Company will commence shipping coal early in October. Repairs on the shipping pier, on the towers of the aerial cableway and on the chutes are being pushed with vigor. The dwelling houses are completely repaired.

The Nova Scotia Steel & Coal Company has decided to grant an increase in wages to the engineers, firemen, conductors and brakemen. The engineers wil lreceive 27½ cents per hour; firemen, 20

cents; brakemen, 19 cents; conductors, 22½ cents. A comparison of the new with the old rates stands as follows:—Conductors—Old rate, 25 cents per hour; new rate, 27½ cents per hour. Firemen—Old rate, 20 cents per hour; new rate, 17½ cents per hour. Brakemen—Old rate, 19 cents per hour; new rate, 17 cents per hour. Conductors—New rate, 22½ cents per hour.

Port Hood.—The Port Hood-Richmond Railway Coal Company installed a Sullivan straight line air compressor early in September. It will be used to operate the pumps and the coal-cutting machines. The old compressor will be repaired and kept in commission. The company has determined, with the assistance of the Provincial Workmen's Association, to eradicate heavy drinkers from their employ. Those who fail to work 22 days in the month will be dismissed, unless due cause can be shown for their absence. In spite of shortage of labor, the mine is raising 400 tons of coal per day. An output of 1,000 tons daily is counted upon next year.

ONTARIO.

Cobalt.—Six carloads of ore have up to the present been shipped from the Cobalt Townsite Mine. The main shaft is down over 100 feet, No. 2 shaft is down 50 feet, and about 620 feet of drifting and cross-cutting has been done at the 50 foot level. Fifty men are now employed and the number will be increased.

The shaft of the Big Pete Mine is now 170 feet. The ore is from two to three feet in width. The vein is vertical and the pay chute dips at sixty degrees in the vein. The company is installing a concentrating plant of 100 tons capacity. The plant consists of one 10 by 20 Blake crusher; one set of 42 by 14 roughing rolls; one set 32 by 12 medium rolls and one set 32 by 10 fine rolls. From the coarse rolls the material passes through screens where the size between three and eight mesh is removed and sent to two-compartment jigs. The under size from the eight mesh screen goes to a twenty mesh screen. The over size from this goes to a three-compartment jig, the undersize going to a hydraulic classifier. The tailings from the two-compartment jigs goe to the medium rolls, and are then crushed and elevated to a twenty mesh screen, where the fines are removed and the oversize goes to three-compartment jigs. The tailings from the three-compartment jigs pass through the fine rolls, where the material is crushed to twenty mesh. All material after passing the twenty mesh screen goes to a hydraulic sizer of two compartment, each compartment giving a different table product. The overflow from the sizer goes to Callow settlers and from settlers to vanners. In all cases the oversize from screens is returned to the rolls until it passes the twenty mesh screen. The company experimented with four car loads of ore before deciding upon the necessary machinery. Any additional treatment, required in the future, will be along the lines of pan amalgamation. The company is now installing a larger hoist and a 1,500 foot compressor. The entire plant will be in operation during October.

Cobalt.—The concentrating plant of the Cobalt Central Mine will very shortly be in operation. Low grade ore has been stacked in quantity sufficient to keep the concentrator running for some weeks, and the company will attempt to keep a large reserve always on hand.

The Buffalo Mine is making strong progress. The full complement of men are working and the camp quarters are to be enlarged.

The Silver Bar Mine, which has been lately in the control of Rinaldo McConnell, of Ottawa, and J. E. H. Barnett, of Renfrew, passed into the hands of J. P. Killorin, of Duluth, Minnesota, and E. P. Stone and associates of Saginaw, Mich. The reoganization of the company took place in Ottawa Saturday. E. P. Stone was elected president and managing dicector. Charles McRae, of Sudbury, is secretary-treasurer. The head office will be removed from Ottawa to Sudbury. A new engineer has been appointed to thoroughly overhaul the machinery and have operations commenced as soon as possible.

The Coniagas Mines, Limited, is appealing to the Ontario Railway and Municipal Board against an assessment of $100,000 fixed by the Town of Cobalt for the purpose of levying an income tax. The proprietors claim that they are not liable to taxation on income.

Letters received by the T. & N. O. Railway Commisison from their mining engineer, Mr. A. A. Cole, announce the discovery of promising quartz veins five miles north of Temagami station. On one property that was being developed for molybdenum, free gold was found.

The report that La Rose Mine has been sold to an English syndicate is being persistently circulated. Although shipments have been light, yet La Rose is in fine condition. Cross-cutting and drifting have been vigorously pushed. A large quantity of ore is blocked out on the second and third levels.

The Coniagas concentrator is now operating. It will have a capacity of 100 tons of low grade ore per day. The slimes from the ore will be caught in settling tanks.

Port Arthur.—Five carloads of silver concentrates, valued at $40,000, have been shipped to United States smelters by the Hanson Consolidated Mines at Port Arthur. During August this company milled an average of 50 tons of ore a day, the total being 1,500 tons for the month.

Wabigoon.—Inspector E. T. Corkill recently visited four actively operating mines in this district—the Laurentian, the Paymaster, the Victory and the Detola. Mr. Corkill has been quoted as being favorably impressed with the progress of the camp.

Sault Ste Marie.—The rail mill of the Superior Corporation re-opened on September 9th. It had been closed down for two weeks. No. 1 blast furnace is now relined. The ore supply is looking more promising.

September 16th and 17th the visiting British journalists spent at Sault Ste. Marie. After visiting the pulp mills and other points of interest on Monday evening and Tuesday, a dinner was tendered them on Tuesday evening at the International Hotel. About 100 prominent citizens were among the guests. After leaving Sault Ste. Marie the following itinerary was adhered to:—

Wednesday, September 18th.—Morning, Bruce Mines—Ontario Copper Mining and Smelting Company. Afternoon, Blind River—Inspection of Eddy Brothers' lumber plant and other mills. Evening,Espanola—Spanish River Pulp & Paper Company's plant.

Thursday, September 19th.—Morning, Crean Hill, property of Canadian Copper Company. Afternoon, Victoria Mines—Mond Nickel Company's mine. Evening—Sudbury.

Friday, September 20th.—Copper Cliff—Visit to the celebrated Creighton mine and smelter, property of the Canadian Copper Company. Evening—Sudbury.

Saturday, September, 21st.—Trip over C. N. R. into Hutton Township to the Moose Mountain Iron Mine. Evening—Off to Temagami.

Sunday, September 22nd.—Resting on Lake Temagami, situated in the largest of Ontario's pine forest reserves.

Monday, September 23rd.—Cobalt—Visit to various silver mining properties. Evening—Haiyelbury, prettily situated on Lake Temiskaming.

Tuesday, September 24th—New Liskeard, the gateway to the great Clay Belt. Evening—Return to Toronto.

Wednesday, September 25th—Luncheon at the Speaker's Chambers, Parliament Buildings, Toronto, at 1 p.m., to meet His Honor the Lieutenant-Governor and representative newspaper men of the Province.

ALBERTA.

Coleman.—Mr. A. C. Flumerfelt, president of the British-American Trust Company, the International & Alberta Coal & Coke Companies, located respectively at Coleman and Lundbreck, Alberta, associated with Andrew Laidlaw, of Spokane, and H. N.

Galer, vice-president and genera lmanager of the International and Alberta Coal Companies, has completed negotiations for the purchase of 7,000 acres of coal land, located four miles north of Lethbridge on the east banks of the Belly River, directly opposite the Diamond mine, now being deveolped. The purchase price is stated to be $350,000. The company to develop the property will be called the Royal Collieries Coal Company.

LUNDBRECK.—Overground improvements are being made at the collieries of the Galbraith Coal Company. About $20,000 will be expended. A tramway 1,700 feet long, loading bunkers and a modern hoisting plant are to be constructed.

BRITISH COLUMBIA.

An English syndicate has acquired 360 acres of coal lands on Vancouver Island, four miles from Nanaimo. The lands adjoin the Dunsmuir coal mines. The vendors were the West Wellington Colliery Company, and the consideration was considerably over $375,000. Prospecting with diamond drills is being vigorously carried on.

BOUNDARY.—Last week the new electric compressor, which was ordered some eight or ten months ago from the Allis-Chalmers-Bullock, Limited, by the Crescent Mines, Limited, arrived in Greenwood, and is now being installed as rapidly as possible at the company's mine, being of seven drill capacity. Power will be furnished by the Greenwood City Waterworks Company.

One carload of concentrates will shortly be shipped from the Cariboo-McKinney.

As eight furnaces are now in commission at the Granby smelter, about one car of blister copper is being shipped daily.

The mines of the Granby Company are working at full capacity. Five hundred and fifty men are employed.

Since the British Columbia Copper Company took over the Lone Star mine, nearly 1,600 feet of development work has been done. Most of the work has been in ore. In the near future a diamond drill is to be shipped to the Lone Star.

On September 7th there were eleven furnaces in blast at Boundary's three smelters, six at Granby, two at the British Columbia Copper and three at the Dominion Copper. This is one more than the previous week and it indicates an easing of the coke situation.

VANCOUVER.—Reports have been received of the discovery of coal measures on the mainland of British Columbia in the Harrison Lake country. The exact locality is known only to the prospectors themselves. If coal is there in quantity, it will be easily shipped by a direct water route to Vancouver City.

Under the name of the Hewitt Mining Company, a group of Eastern American capitalists has got control of the Hewitt mine. The company has a capitalization of $800,000, divided into 80,000 shares of $10 each. The properties are the Hewitt, Lorna Doone, both considerable shippers, Rincon, Rincon Fraction, Mole, Crow, Tranquility, Lorna Doone Fraction, Panobscot and Prior, all crown granted. In addition the company has acquired the Silver Wedge group of the three claims on the same vein and the Reid and Tenderfoot on the Wakefield vein. An option has also been taken on the Wakefield group of 12 claims and one the Wakefield mill of 120 tnos daily capacity, which at present is treating the ore of the Vancouver, near the Hewitt, operated by the Le Roi No. 2 of Rossland. From the Wakefield over $300,000 worth of ore has been shipped from two claims, none of the others having been worked. From the Reid and Tenderfoot a recent shipment of a car of 32 tons of ore the to Trail smelter gave returns of 83.5 ounces in silver and 36 per cent. lead. From the Hewitt and Lorna Doone have been shipped since July, 1904, to March 22 of this year, 1,780.3 tons of ore having a net smelter value, ofter deducting freight and treatment, of $73.99 per ton. The Davys lease has netted the lessor $50,000, two-fifths of which was during the first six months of the year.

LADYSMITH.—On No. 6 level, No. 2 sslope of No. 2 Extension mine, six men were seriously burned by an explosion of gas. The men had just reached their work when the explosion occurred. Although it was a very heavy explosion, its effects were local.

NELSON.—Several new mines have become shippers during the pas week. The progress on the Hewitt is satisfactory. A good body of ore has been struck in No. 3 tunnel. The smelters are getting back into normal working shape.

PHOENIX.—The pay rolls of the mining companies operating near Phoenix amounted to a smaller sum in August than usual, owing to the coke shortage.

YUKON.

Dawson, Y. T., Sept. 12.—One of the most gigantic placer deals in the history of the world was made here when 200 mining claims on Dominion Creek were purchased by corporate interests. Records of the transfers have been filed in the gold commissioner's office in Dawson.

It is understood that all the paying portions of the Dominion Creek will be taken over, aggregating perhaps 350 to 400 claims. Frank. W. Morrison, as trustee, has secured 125 of the claims, and Peter Rost has secured the remainder. The new owner is a rich California company.

The ground just bought on Dominion Creek extends from number 10 above Upper Discovery to 223 below Lower Discovery, a distance of 20 miles. Dominion is the longest paying creek in the Klondike camp, and has yielded many fortunes. It is the richest stream on the Indian side of the high divide, and the first stream on that side to be bought by the big corporation. Granville camp, which comprises the lower few miles of Dominion Creek, has been purchased recently, presumably for the Morrison people. Indian River is 30 miles long, and also is the extension of Dominion, which is staked from end to end. Gold Run, Sulphur, Eureka, Quartz and other rich creeks have been organized to a large extent, and also may be bought.

The Guggenheims have now more than 1,700 men on their pay roll in the Yukon. They are pushing operations vigorously.

Hydraulicking has been much interfered with on account of the very dry summer. In fact very little hydraulicking has been carried on at all. Dredges, however, to the number of seven, are in commission, and five more are being assembled and made ready for next year's work.

The Yukon River is lower than ever known. Steamers have difficulty in getting to Dawson City. As a result it is predicted that there will be a shortage of provisions in Yukon this winter.

The otput of gold this season will not exceed $3,000,000.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

For the first six months of 1907, the Dolcoath Mine reports 51,000 tons of rock crushed, 799 tons of concentrates sold and 64 tons of slimes. The rock tonnage is greater than during the preceding six months and the concentrates and tailings less. The higher prices obtained, however, compensate for this decrease.

UNITED STATES.

CALIFORNIA.—From the Tuolumne district comes the report that the Black Oak Mine, formerly owned by eastern people, has been purchased by a Nevada syndicate. It is to be worked on a large scale.

MICHIGAN.—The Michigan Smelting Company, near Houghton, made a record recently. A furnace charge of 2,000,000 pounds of copper was successfully tapped and poured.

MEXICO.

MONTEREY.—Another terrible mine fire occurred at the Esperenza mines, in which 27 miners were killed.

SOUTH AFRICA.

CAPE COLONY.—Exports of diamonds from South Africa for 1906 have been estimated at $46,287,655. A tax of 10 per cent. on raw diamonds woul dmean $3,400,000 a year to Cape Colony. This tax is practically double the previous 5 per cent. income tax, which it supersedes.

The gold output of Rhodesia South reached 55,000 ounces in June and nearly that figure in July. Many of the larger plants are being materially added to.

Commercial Paragraphs

The Chemists' and Surgeons' Supply Company of Montreal have recently supplied McGill University with fifty-five record microscopes for their pathological department.

Conveying and Transmission for August has been received. It is published by the Stephens-Adamson Manufacturing Company, Aurora, Ill. Among other illustrations are some of their "S-A" metal apron conveyors.

Mining and milling interests throughout the country will be interested in knowing that the Boston Consolidated Copper Company's 3,000 ton mill is nearing completition and will go into service at no distant date. Particular interest attaches to this mill by reason of the fact that the Boston Consolidated Company made such exhaustive tests of various types and makes of equipment before deciding upon the installation of Nissen gravity stamps, which they purchased of Fairbanks, Morse & Company. The mill, when completed, will be the largest gravity stamp mill in the world, and is expected to show some very remarkable results.

Fairbanks, Morse & Company, of Denver, recently placed on the market an improved air hammer drill, which they manufacture under the name of Sinclair Drill, H. L. Sinclair being the patentee. This improved drill is an all-steel machine, as are all Sinclair drills, and is equipped with air feed column, being quite similar in construction to the standard Sinclair air hammer drill. It has, however, a drilling capacity which is double that of the standard hammer drill, and has frequently demonstrated an average drilling capacity of 8 inches to 10 inches per minute in the hardest granite obtainable in Denver. The manufacturers report a very strong demand for these machines, and have completed arrangements for largely increased output.

Company Notes

A quarterly dividend of one per cent. has been declared on the common stock of the Dominion Coal Company, Limited, payable October 1st, 1907, to shareholders of record at the closing of the books on September 20th, 1907.

The annual meeting of the Granby Company has been called for October at the New York office, when the reports for the company's fiscal year, ended June 30th last, will be made public. Notwithstanding the great drawbacks of fuel and car shortage last winter and spring, curtailing operations at mines and smelter to a considerable degree, the report is expected to make a favorable showing.

At meetings of subsidiary companies of the Amalgamated Copper Company, in October, dividends of all constituents will be reduced from 40 to 50 per cent. it is expected Amalgamated Copper directors will declare a dividend of about 1 per cent. for the quarter, as compared with 2 per cent. in previous quarter. Anaconda dividend will be $1 or $1.25 a share for the quarter, as compared with $1.75 in the previous quarter. Boston and Montana about two months ago declared quarterly dividend of $2 a share and ten dollars extra. Dividends at the meeting next month will probably be 50 per cent. less. These reductions, as is well known, will be due to the demoralized condition of the copper market.

STATISTICS AND RETURNS

The output of the collieries of the Crow's Nest Pass Coal Company for the week ended September 20th was 21,905 tons, or a daily average of 3,651 tons. For the corresponding week of last year the output was 19,586 tons, a daily average of 3,264 tons.

British Columbia ore shipments, week ending September 14th:—

Following were the shipments and smelter receipts in Southeastern British Columbia districts for the past week and year to date:—

Boundary, 33,349, 840,585; Rossland, 3,344, 187,168; Eastern Columbia, 2,932, 97,724; total, 39,625, 1,125,477.

Smelter receipts: Grand Forks, 19,827, 446,933; Greenwood, 5,487, 235,983; Boundary Falls, 6,031, 133,270; Trail, 5,677, 164,769; Northport, 1,489, 67,838; Marysville, 600, 22,600; Nelson, 11,360. Total, 99,111, 1,062,733.

CROW'S NEST OUTPUT.

The output of Crow's Nest Pass Coal Company for the week ended September 13th was 22,962 tons, a daily average of 3,827 tons. For the corresponding week of last year the output was 19,493, a daily average of 3,242 tons.

COBALT ORE SHIPMENTS.

The Temiskaming & Northern Ontario Railway Commission report the following ore shipments from Cobalt for the week ending Saturday, September 14th:—

	Lbs.
Foster Mine	62,950
Silver Queen	120,000
Buffalo	60,00
La Rose	43,800
Total	286,750

Departmental returns show that the following were the coal exports from the Crow's Nest Pass, which were passed by the custom house at Nelson for the first six months of the current year:—January, 33,290 tons, value, $76,405; February, 31,955 tons, value, $63,919; March, 51,905 tons, value, $105,874; April, 13,934 tons, value, $27,898; May, 9,276 tons, value, $19,692; June, 28,236 tons, value, $56,059.

Coke from Crow's Nest Pass passed by Nelson custom house for export for first six months of the year was:—January, 3,313 tons, value, $13,333; February, 3,716 tons, value, $18,258; March, 7,132 tons, value, $32,519; April, 5,821 tons, value, $13,407; May, 950 tons, value, $4,121; June, 3,083 tons, value, $13,869. July and August returns are not completed. Totals for fiscal year ended June 30, 1907, are:— Coal, 282,598 tons, value, $590,117; coke, 22,907 tons, value, $108,398.

Following are the ore shipments and the smelter receipts in Southeastern British Columbia for the week ending September 7th and year to date:—

Shipments—

	Week.	Year.
Boundary	22,463	807,116
Rossland	4,616	183,724
East of Columbia River	2,682	90,165
Total	29,761	1,081,005

Smelter receipts:—	Week.	Year.
Grand Forks	12,549	434,106
Greenwood	3,941	230,496
Boundary Falls	4,930	120,239
Trail	4,848	159,092
Nelson	26	11,340
Northport	1,694	67,319
Marysville	600	21,600
Total	28,588	1,044,192

Dominion Coal Company's outputs, 1906 and 1907:—

	1906.	1907.
January	231,606	252,248
February	225,716	225,988
March	310,220	212,831
April	296,417	316,384
May	323,777	327,269
June	325,991	319,560
July	318,291	314,559
August	331,716	325,930

Dominion Coal Company's output, September 1 to 15:—

	Tons.
No. 1	18,360
No. 2	24,330
No. 3	11,540
No. 4	17,770
No. 5	25,950
No. 6	8,300
No. 8	9,030
No. 9	13,200
No. 10	3,730
Total	132,210
Shipments	132,814

The shipments of coal by the Nova Scotia Steel & Coal Company compare as follows:—

Shipments August, 1907	81,590
Shipments August, 1906	74,873
Increase August, 1907	6,717
Shipments 8 months, 1907	404,880
Shipments 8 months, 1906	410,598
Decrease 8 months, 1907	5,718

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

Buffalo—Week ending Sept. 14, ore in pounds, 60,000; since Jan. 1, ore in pounds, 1,738,830.

Foster—Week ending Sept. 14, ore in pounds, 62,950; since Jan. 1, ore in pounds, 319,306.

La Rose—Week ending Sept. 14, ore in pounds, 43,800; since Jan. 1, ore in pounds, 1,102,102.

Silver Queen—Week ending Sept. 14, ore in pounds, 120,000; since Jan. 1, ore in pounds, 772,157.

The total shipments for the week were 286,750 pounds, or 143 tons.

The total shipments since Jan. 1, 1907, are now 17,628,210 pounds, or 8,814 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2,144 tons, valued at $1,473,196 in 1906, 5,129 tons, valued at $3,900,000.

METAL, ORE AND MINERAL MARKET.

Aluminium No. 1 grade ingots—45 to 47 cents per lb.
Antimony—9 1-4 to 11 cents per lb.
Arsenic, white—7 1-2 to 7 3-4 cents per lb.
Barytes, crude—$11 to $15 per ton.
Bismuth, metal—$1.50 to $1.75 per lb.
Cadmium, metal—$1.35 to $1.40 per lb.
Carbons for drills—$75 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt Ont., unrefined—25 to 40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$12 per short ton.
Flourspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$15 to $30 per ton.
Lead—4.75 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$50 to $80 per ton.
Mica, scrap—$10 to $15 per ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.
Nickel, metal—45 to 55 cents per lb.
Platinum, ordinary metal—$28.50 per ounce.
Platinum, scrap—$23 to $24.
Pyrite, 38 to 45 per cent. sulphur, lump ore—10 1-2 to 11 3-4 cents per unit.
Quicksilver—$40 to $41 per 75 lb. flask.
Sulphur—$23 per long ton.
Talc—$18 to $25 per ton.
Tungsten, pure metal—$1.28 per lb.
Tungsten ore, 60 per cent. pure—$9 per unit.
Tin.—37 3-4 cents per lb.

MARKET NOTES.

Spelter.—Again the price of spelter has dropped. New York, 5.15 cents per lb.; London, £21. 5s.

Lead.—The American Smelting & Refining Company has reduced the price of lead to 4.75 cents per lb. This price obtains firmly in New York. London, £19 15s. for Spanish lead.

Tin.—The tin market has jumped up and down over a wide range. New York prices are steady at 37 3-4 cents per lb. London, £167 15s. for spot.

Copper.—Copper is unsettled at 15 cents to 16 1-4 cents for lake, 14 3-4 to 15 1-5 cents for electrolytic. Activity is expected in the near future. London, £66 15s. for spot standard.

Silver.—Sept. 5, 68 1-8; Sept. 6, 68 1-2; Sept. 7, 68 1-2; Sept. 9, 68 3-8; Sept. 10, 68 1-8; Sept. 11, 67 3-4; Sept. 12, 68; Sept. 13, 67 3-4; Sept. 14, 67 3-4; Sept. 16, 67 7-8; Sept. 17, 67 5-8; Sept. 18, 67 5-8.

Mexican dollars, 52 1-2 cents; sterling exchange, $4.854.

Pig Iron.—Pittsburg—Bessemer pig, $22.90; No. 2 foundry, $22.25.

Iron Ore.—Bessemer, old range, $5; Bessemer, Mesabi, $4.75; non-Bessemer, old range, $4.30; silicious, non-Bessemer, $2.50.

Quicksilver—$40 to $41 per 75 lb. flask.

New Dividends

Nipissing Mines, Limited, have declared the regular quarterly dividend of 3 per cent., payable October 21st. The directors of the Nipissing Mining Company, the operating concern, declared a lump sum divided of $180,000, payable to the holding company, the Nipissing Mines Company. Nipissing cash and cash assets totalled $805,000, as compared with $775,000 on July 1st.

Granby Consolidated has declared its regular quarterly dividend amounting to 3 per cent. on the outstanding capital shares of the company. The dividend is announced as 2 per cent. regular and 1 per cent. extra. As there are 135,000 issued shares of the par value of $100 each, this dividend, like the last six declarations of the company, amounts to $405,000. This dividend, No. 8, is payable from the New York offices on September 30th.

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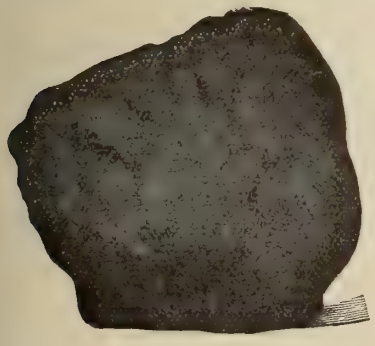
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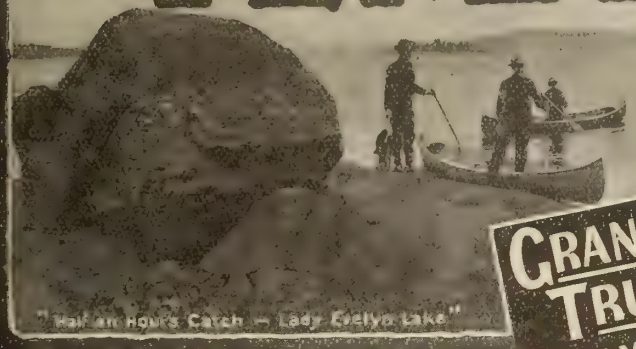
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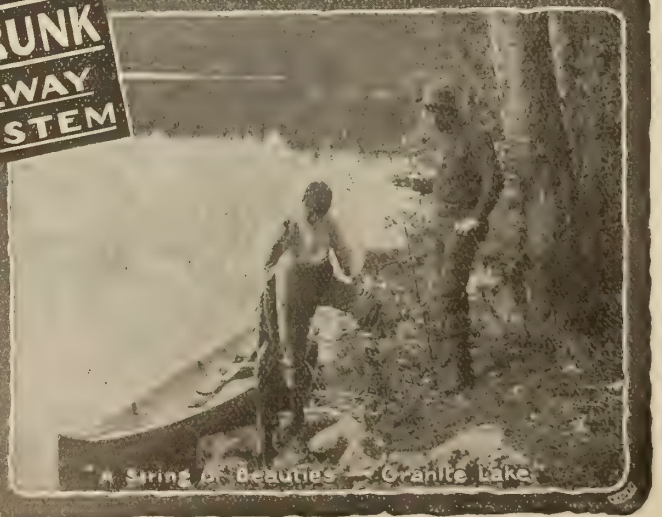
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COAL—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

QUARTZ—A person 18 years of age, or over, having discovered mineral in place, may locate a claim 1,500 x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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Our Fall and Winter Catalogue is ready for mailing on the first of September. Send us your name and address and we will gladly mail you one and put you on the list for all subsequent catalogues. Our new Catalogue for 1908 is a complete price list of nearly every article of merchandise to be found in the store. A veritable hand-book of information for housekeepers and a thing of interest for everybody who has buying to do and money to spend. Write for it now so as we can have your name on the list in time for the first mailing.

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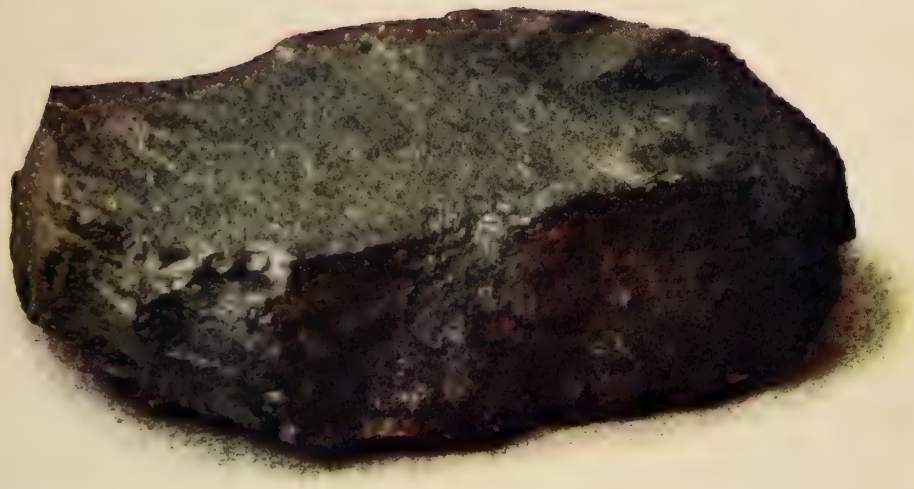
Announcement

THE publishers of THE CANADIAN MINING JOURNAL are presently to issue a Souvenir Handbook commemorating the recent visit of the American Institute of Mining Engineers to Ontario. This Handbook will be in every way a complete and appropriate memento of an important event. The cover has been specially designed. The text will embody a synopsis of the proceedings and expressed opinions of the eminent visitors, and historical and descriptive sketches of the mining districts visited. Many half-tones and maps will embellish the reading matter.

The Handbook will appear during September. As the edition will be limited, orders should be placed at once. The price is One Dollar.

THE CANADIAN MINING JOURNAL

I. No. 15 New Series | TORONTO and MONTREAL | Old Series, Volume xxviii. No. 17



Ontario Magnetite

Pages of Special Interest

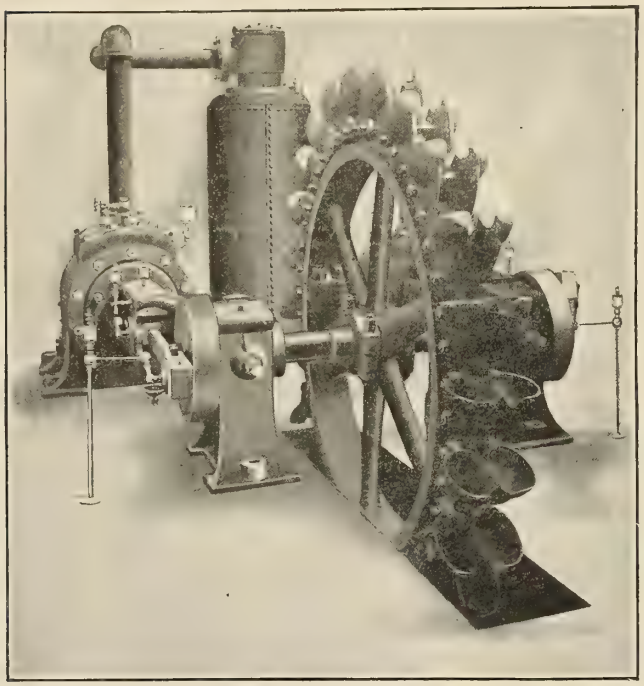
CONTENTS - - - - - - 1
INDEX TO ADVERTISERS - - - - XXVIII
BUYERS' DIRECTORY - - - - - XXX

WANT ADVERTISEMENTS - XVII
PROFESSIONAL CARDS - XIX, XX XXI and XXII
BUYERS AND SELLERS OF METALS XXIV and XXV

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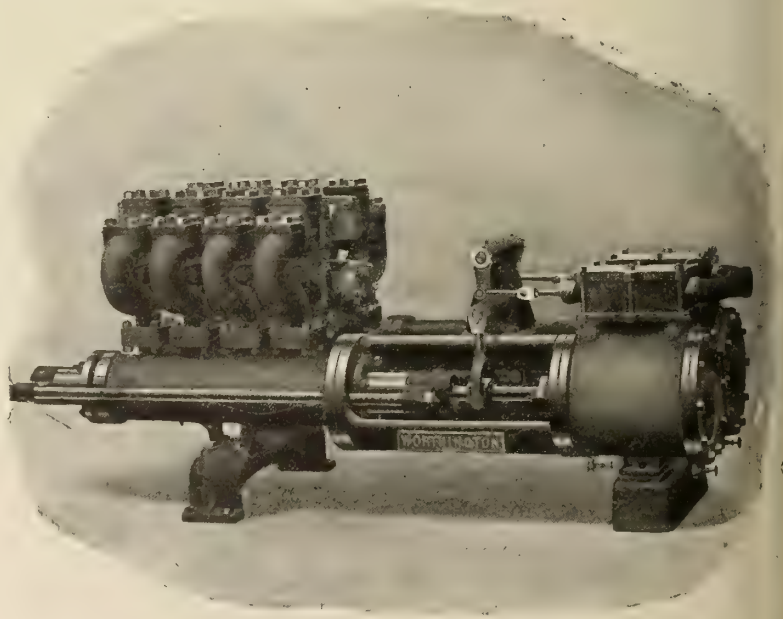
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$24,980,546

The Tonnage of Ore mined in 1906 was 1,963,872 tons The Gold Production in 1906 was $5,579,039 the Lead Output 52, 408,217 lb., and the Copper 42,990,488 lb.

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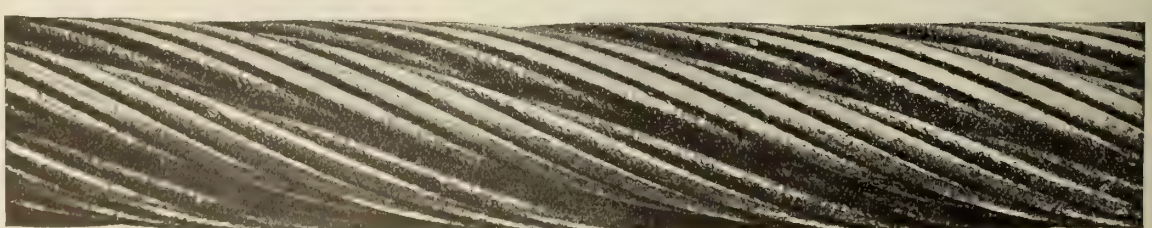


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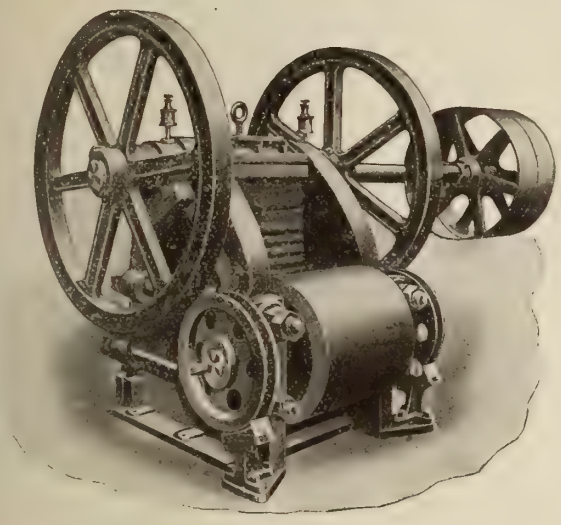
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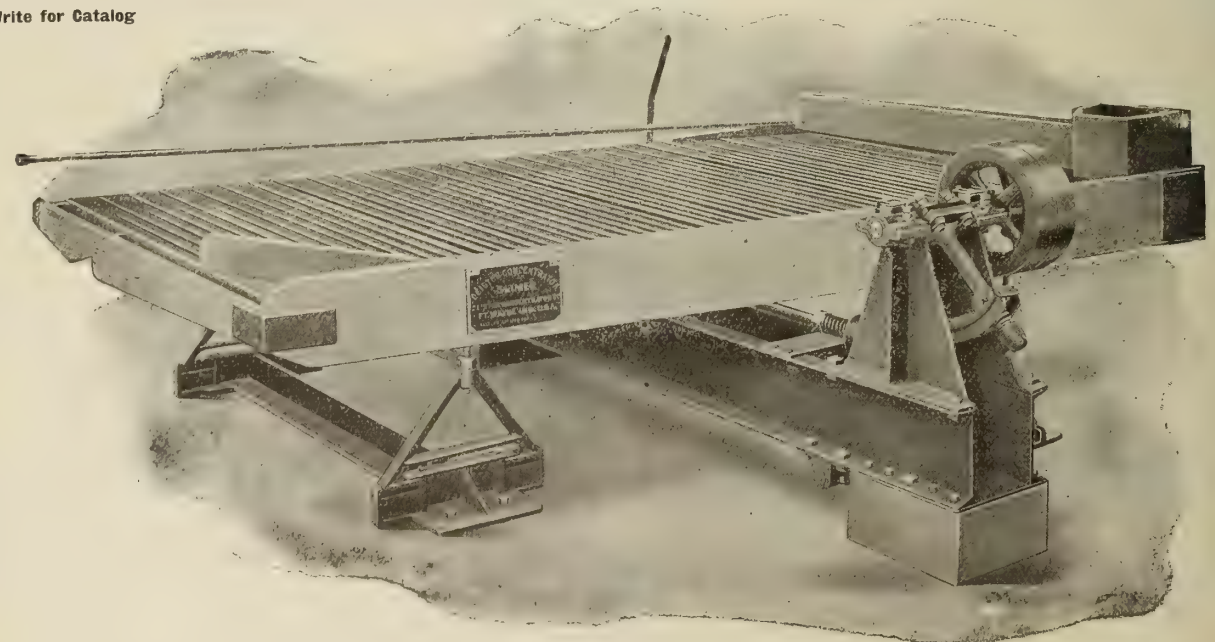
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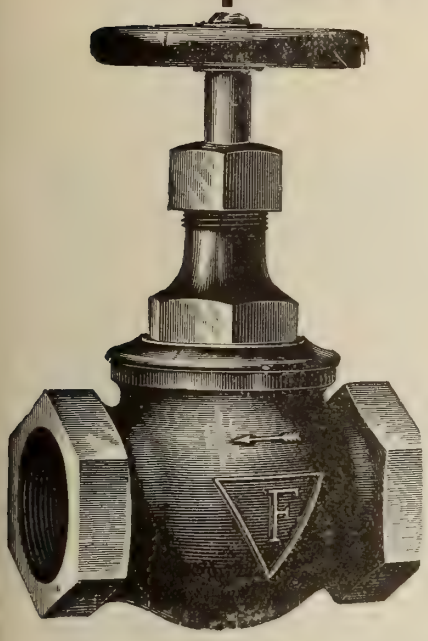
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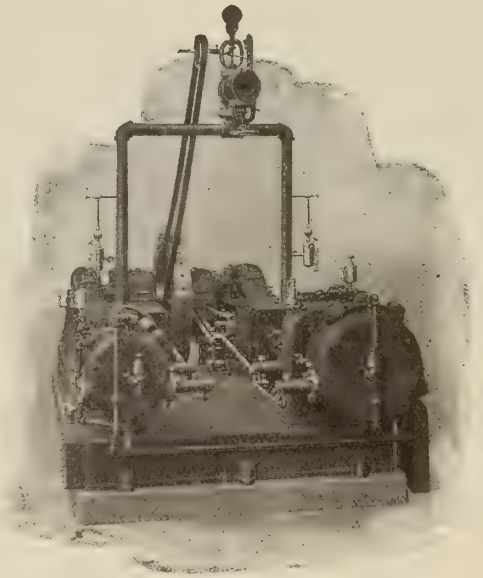
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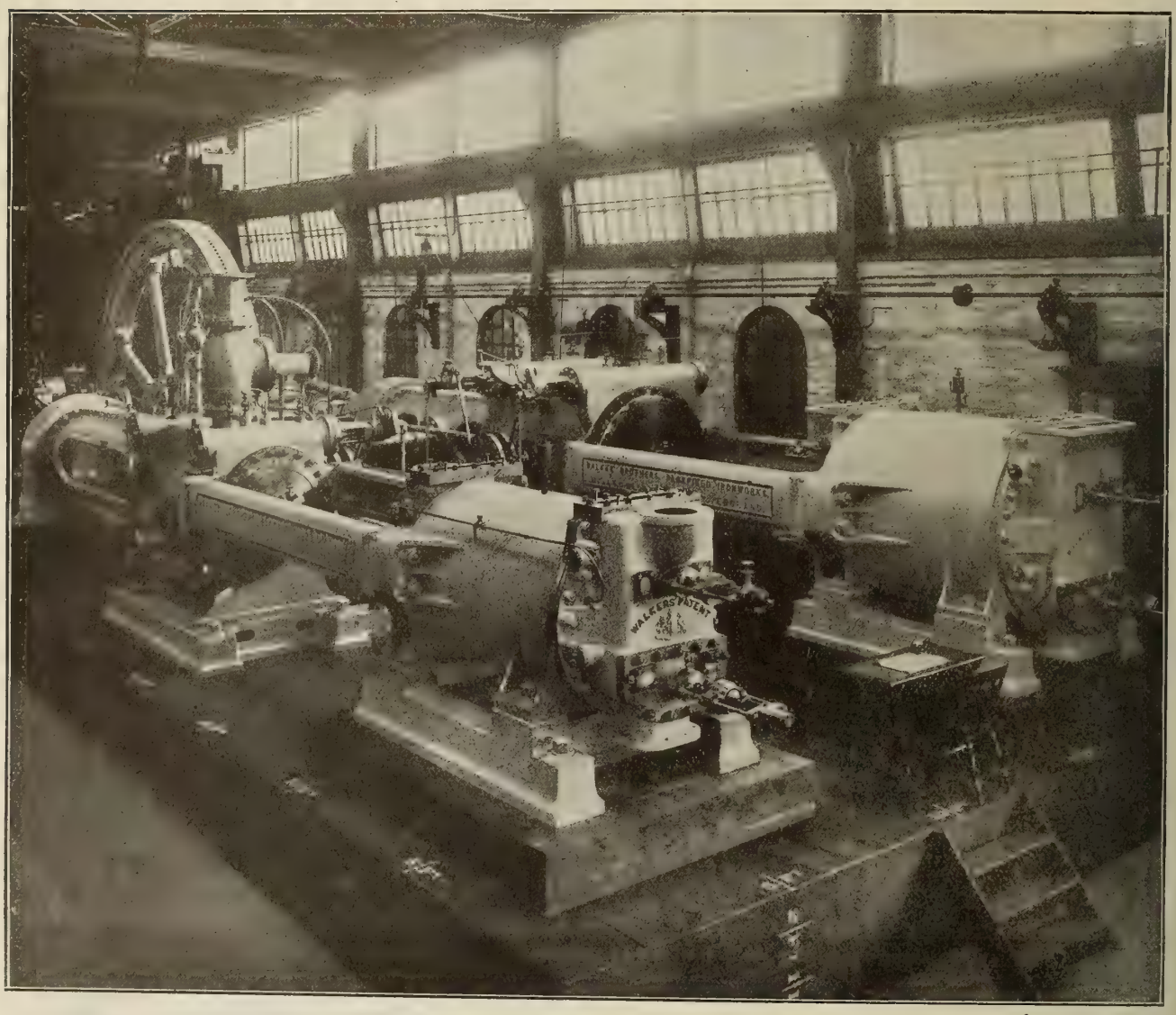
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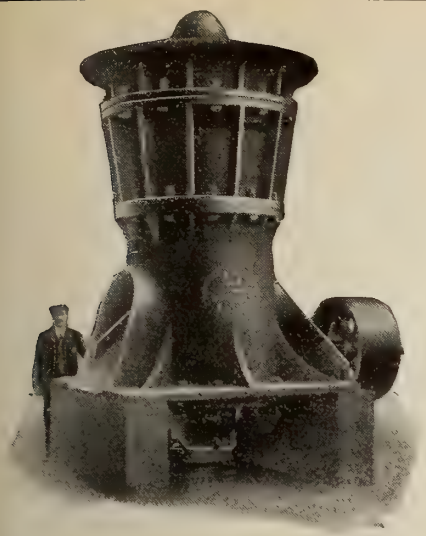
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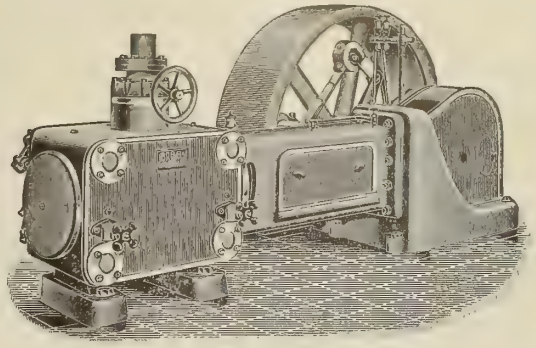
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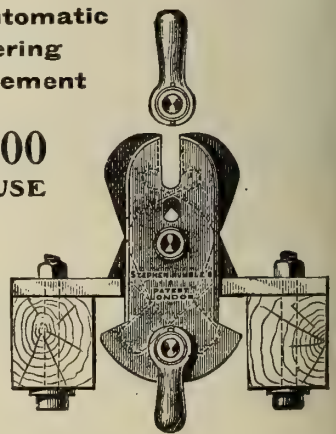
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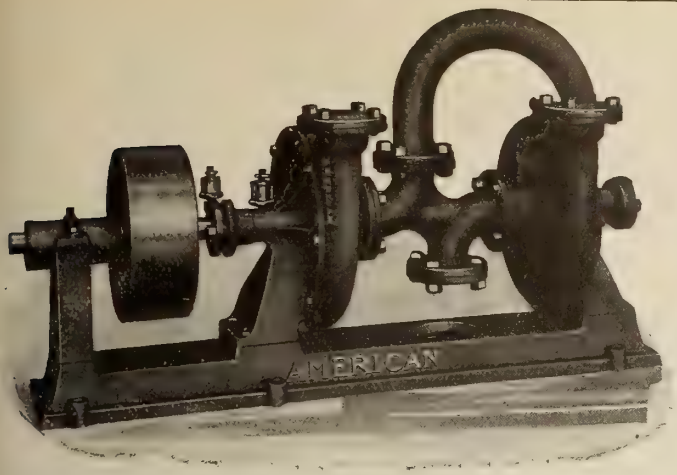
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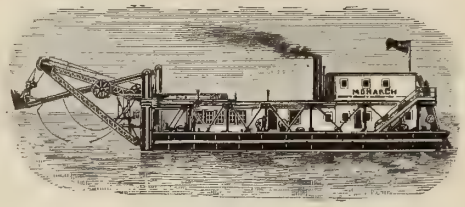
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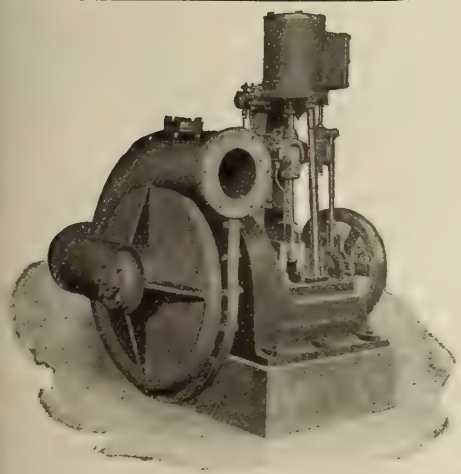
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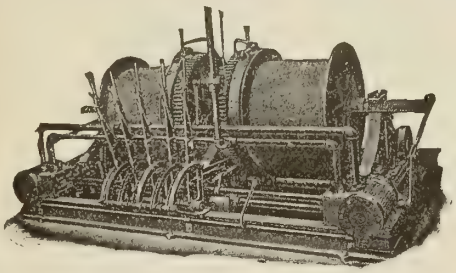
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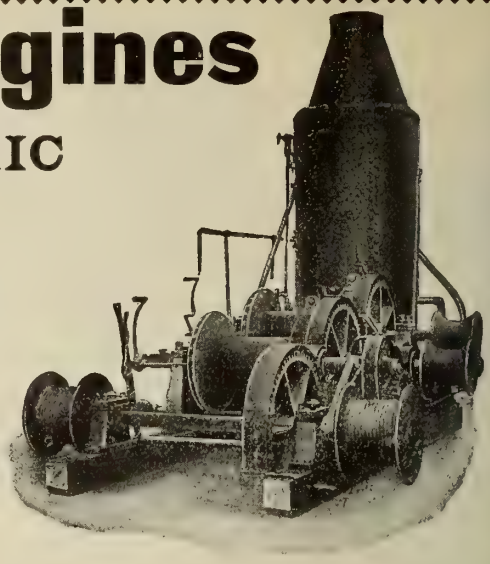
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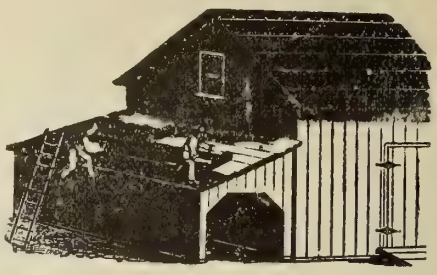
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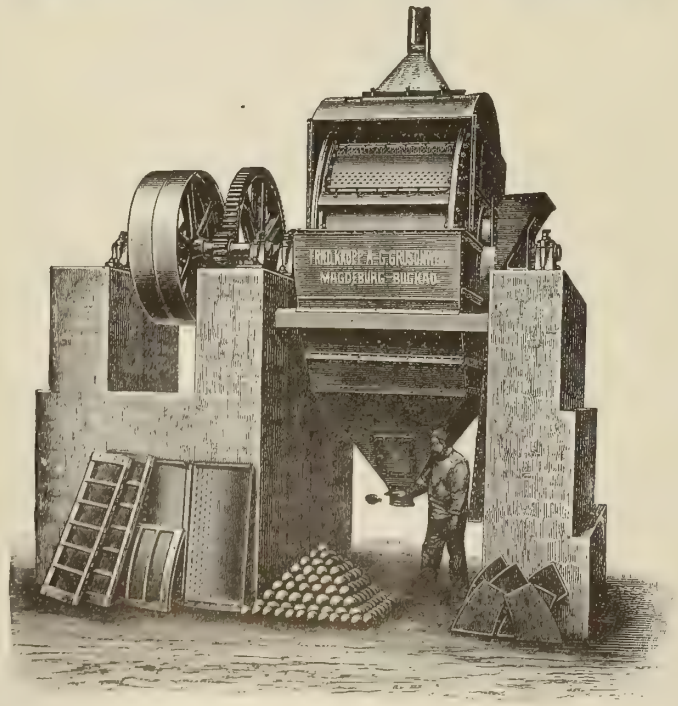
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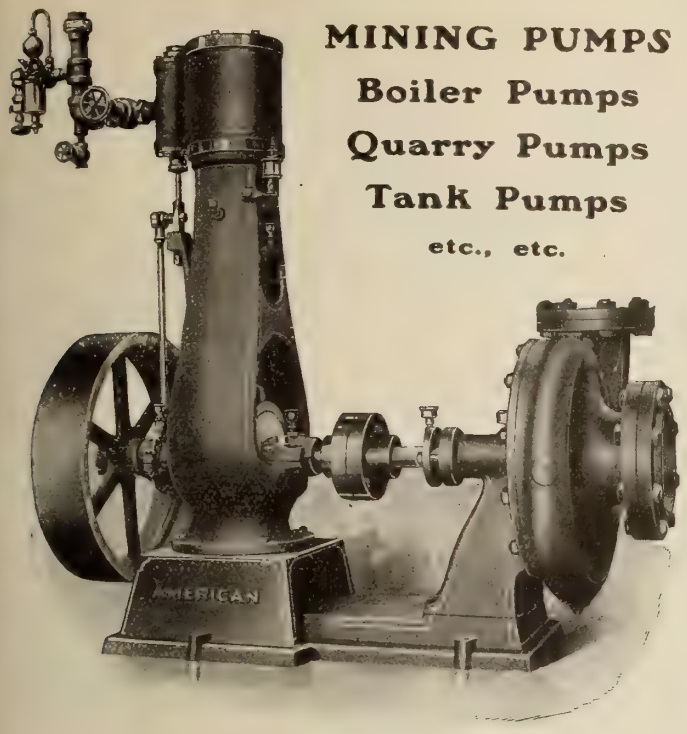
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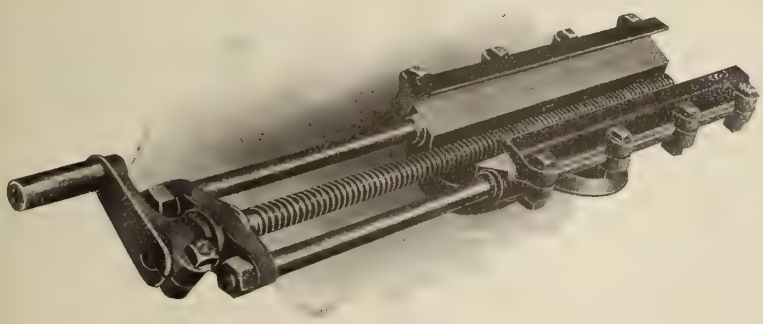
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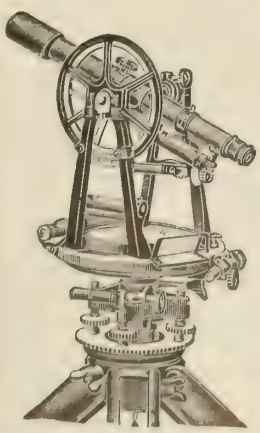
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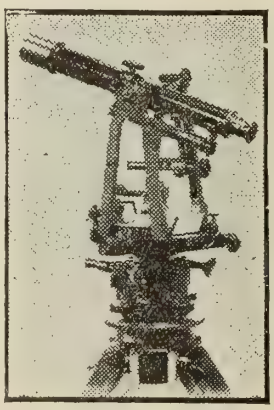
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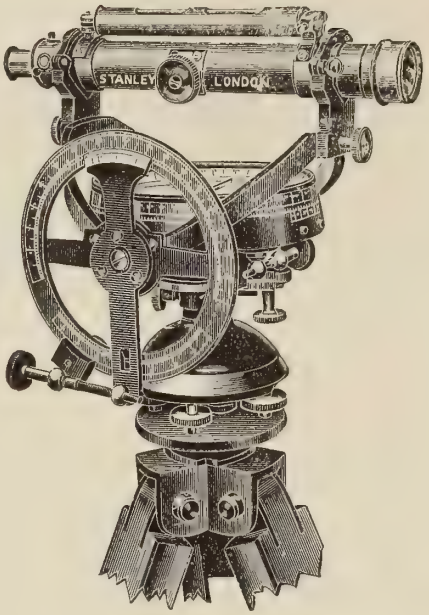
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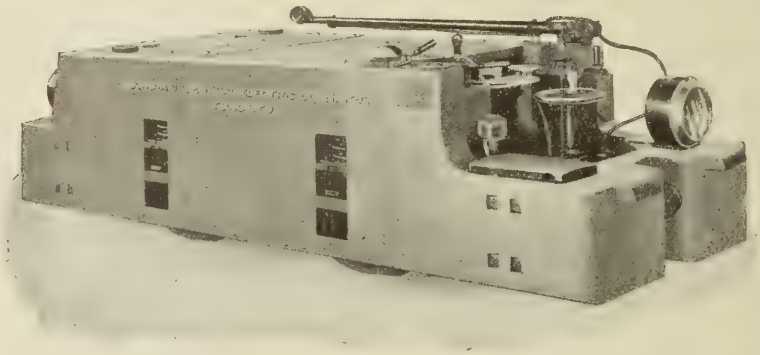
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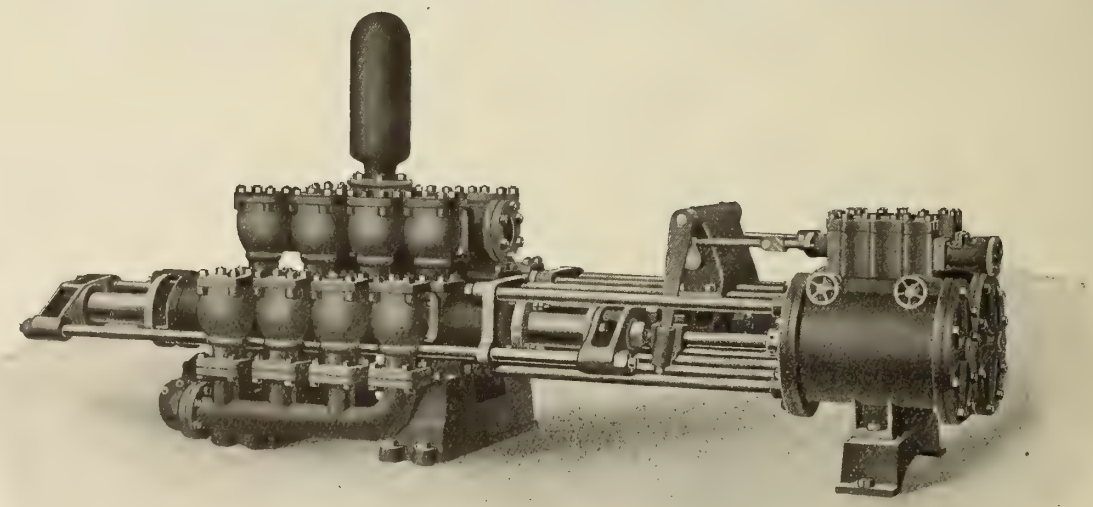
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THE OFFICIAL ORGAN OF THE CANADIAN MINING INSTITUTE

VOL. I, No. 15, New Series . TORONTO and MONTREAL, October 15, 1907 Old Series, Volume xxviii, No. 17

The Canadian Mining Journal

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M. E., Nelson, B. C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

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SOPHISTRY.

The *Toronto Evening Telegram*, in a recent editorial, contends that, so long as newspapers reserve the right of criticism, they can fairly and honestly sell space to legally constituted mining companies.

Preliminarily we may remark that the *Telegram* has kept its columns clean—cleaner considerably from the taint of dishonest mining advertisements than, for instance, has the *Globe* or the *World*. Its argument, therefore, we may respect, even though we fail to agree with it.

Our reasons for differing from the *Telegram* may be brought out by an instance from real life. The *Globe* of October 2nd publishes an advertisement of a mining stock. The character of this advertisement is fully explained in this issue of THE CANADIAN MINING JOURNAL. Briefly, it is dishonest and illegal. It occupies slightly more than one-half page in the *Globe*.

The *Globe* of Monday, October 7th, points an accusing finger at a contemporary for publishing racing tips of a nature calculated to part a callow youth from his money.

Now the *Telegram* will admit that unless care is exercised in the publication of mining advertisements, more harm and more loss can easily result to a greater number of all sorts and conditions of people than could be possible in the case of a race track tip. The latter appeals to a limited class. The former are so coated and glazed that they appeal to the whole reading public.

We fail to see that the *Telegram* can justify by means of logic a contention that its own honesty has not permitted it to put into practice.

Our country has suffered far too much hurt from wildcats. THE CANADIAN MINING JOURNAL believes that they will be exterminated only by a plain statement of the truth. It is too late in the day to indulge in vague moralizing. It is also too late to allow the observance of the pleasant little courtesies and anonymities of journalism to interfere with a clear understanding of the situation.

COAL CUTTING MACHINERY.

Established customs and usages die hard. Great Britain has become, quite unjustly, proverbial for the reluctance with which innovations are accepted. In the United States the pendulum swings to the other extreme. New machinery, for instance, is not infrequently installed in place of old, merely because it is new. Canada is not free from either of these extremes. Mining companies very often make lavish purchases of untried ma-

chinery that finds its way to the scrap pile before it has seen any substantial service. On the other hand, we have an example of groundless prejudice in the case of the Cape Breton coal miners, who are petitioning the Local Government to prohibit the use of disc-and-chain coal cutters in pillar work in Nova Scotian collieries. Our Nova Scotian correspondent describes the condition of affairs accurately in his current letter. "One had thought, however, that this time-worn objection to the mechanical coal cutter had been relegated to oblivion along with the objections made to the spinning mule and the steam locomotive."

It is evident that the miners' society, the Provincial Workmen's Association, has not given the question deep thought. It is an easy matter to create and foster a groundless prejudice against new machinery, more especially when that machinery revolutionizes mining methods. But, ultimately, the effect of such an agitation will be harmful alike to mine and miners. Mechanical coal cutters are not merely time-saving devices. In experienced hands they increase the earning capacity of the miner and the output of the mine. They are an essential of modern practice. The miners of Cape Breton are physically and intellectually the equals if not the superiors of any other stratum of society. They have the means through their organization of studying the record of coal cutting machinery in other countries. It will be a sad blow to the prestige of the P. W. A. if it is directly or indirectly responsible for preventing the use of modern and efficient mining machinery.

CANADA AND THE JAMESTOWN EXPOSITION

The management of the Jamestown Exposition has set aside October 24th as "Nova Scotia Day." On that day it is hoped that the Governor-General of Canada, the Lieutenant-Governor and Premier of Nova Scotia and other distinguished officials will attend the Exposition.

The following day will be celebrated as "Canada Day."

A gratifying consideration is the fact that Nova Scotia's exhibit of gold ores is the most complete to be seen at the Exposition.

NORTH HASTINGS.

Without noise or bluster a revival of mining has taken place in North Hastings. At Deloro, the new plant of the Deloro Mining & Reduction Company is providing a means for the opening up of the rich arsenical pyrites deposits of that section. Near Madoc the old Henderson talc mine is producing granular talc of most exceptional purity. Iron pyrite deposits are being worked in the surrounding district. It is probable also that the old Belmont gold mine will take a new lease of life. Farther north the mines of the Mineral Range Iron Mining Company at Bessemer are producing steadily a high grade low phosphorus magnetite. In gold, copper, iron, arsenic, talc and fluorspar, not to mention excellent marble and other building stones, North Hastings has the sound basis of a large and varied mineral industry.

A WARNING

As noted elsewhere, Law & Company, the promoters of "Highland Mary" and other Larder Lake companies, have been advised by the Attorney-General's Department to withdraw their advertisement of that affair from the Toronto dailies. This fact should be given wide publicity. We urgently request every reader of THE CANADIAN MINING JOURNAL to aid us in preventing the flotation of such companies. The principal sufferers in all such wild schemes are people with small savings bank accounts, who readily believe the plausible untruths served out to them in the shape of advertisements. We have received full particulars of several instances where farmers and school teachers have been induced to put all their savings into one of these wild cats. These things we intend to search out.

With the intelligent help of our readers we know that it will be possible to prevent the publication of dishonest mining "literature" all over Canada. Just now Law & Company are advertising "Highland Mary" in Quebec and Nova Scotia.

There is no crime meaner, none more sordid, none quite so deserving of contempt, as the deliberate attempt of brokers to misrepresent what they have to sell in such a way that poor and unsophisticated people will give up their savings in the hope of getting rich by a short cut. Advertisements of such things as "Highland Mary" are tossed aside, laughed at, by men who know anything about what mining means.

Editorial Notes.

In our issue of October 1st suitable acknowledgment was omitted of the fact that the paper on "Coal Briquetting" was read at the Toronto meeting of the American Institute of Mining Engineers. We wish to express our regret that this oversight occurred.

The United States postal authorities are making war upon fraudulent mining stock companies. It is being pointed out by the American press that the present force of inspectors is inadequate. Evidence sufficient for the conviction of offenders is so hard to get that often the promoters have amassed a fortune before they can be caught and have escaped to more salubrious climates.

Messrs. Law & Company, the promoters of "Highland Mary" were notified on October 4th that the advertisement appearing over their name was in contravention of the Ontario Compannies' Act and that it must be withdrawn from the papers. The Attorney-General's Department acted promptly in this matter. For this the Department deserves warm praise.

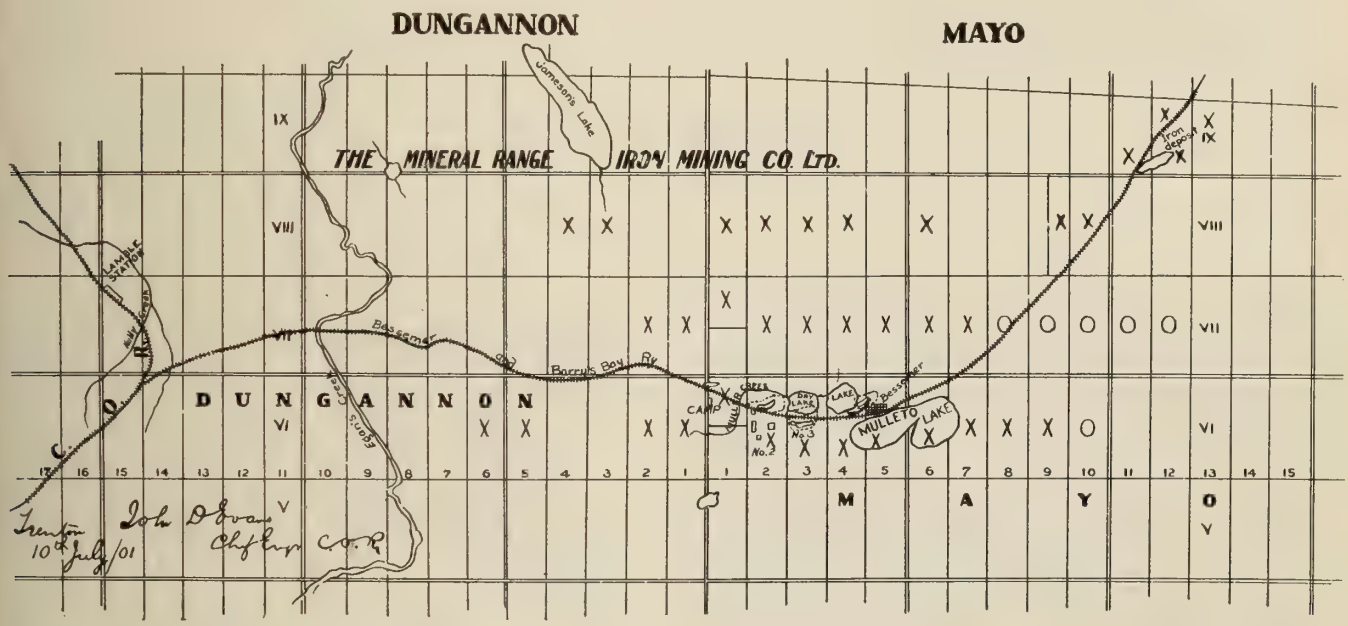
The Magnetite Mines of the Mineral Range Iron Mining Company, Limited, at Bessemer, Hastings County, Ontario.

The pluck and clean fighting qualities of one man have been the chief factors in the exploitation and development of what is undoubtedly one of the most promising magnetite deposits in Canada.

Near L'Amable Station on the Central Ontario Railway, the spur line of the Mineral Range Iron Mining Company's provides means of transportation for the ore from the Bessemer mines. To Mr. H. C. Farnum, who is the discoverer of the deposits, the organizer of the company and the general manager of the mines and railway, belongs the credit of beginning the enterprise and of steering it through many shoals.

The mines are situated about five miles northeast of L'Amable Station. The company controls 700 acres of developed mineral claims from which ore has been shipped and sold, and 3,000 acres of undeveloped claims.

The ore bodies lie mainly in diorite, although at No. 2 mine there is an intrusion of granite. The ore itself is a high grade granular magnetite, containing phosphorus well below the bessemer limit, very little sulphur and not a trace of titanium. A very pure magnetite compact massive and displaying a string vitrous lustre is also found, principally at No. 2 mine. With the ore is associated a fluctuating percentage of calcite. Iron pyrites also occurs, but in such a manner as not to affect the value of the ore. This is explained by the fact that this objectionable mineral is not disseminated through the ore, but is found as the filling matter of small stringers, in distinct and easily separable masses along the contact of the ore and the wall rocks, and sometimes on the contact faces of the ore and included masses of rock. In mining, crushing and loading the ore sufficient culling is done to bring the sulphur down to a negligible amount.



MAP OF PROPERTY OF M.R.I.M. CO., LTD.—LOTS MARKED X AND O.

The ore bodies have a dip of 60 degrees south and a general northeast and southwest strike. The extent of these bodies it is impossible to estimate accurately. More than 6,000,000 tons of ore is in sight. But there is strong evidence that the range is continuous over the two and one-half miles intervening between Nos. 3 and 4 mines and Child's mine to the northeast. It is neither safe nor



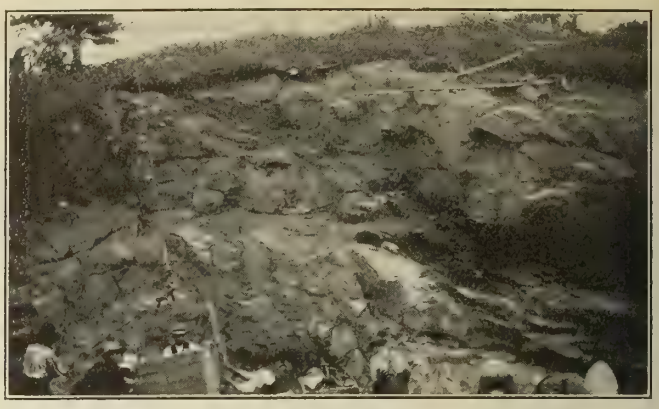
Office and Shop at Bessemer.



View from Lake.



Boiler House at No. 4 Mine in Course of Construction.



Open Cut at Bessemer.

wise to attempt to compute the possible tonnage of this vast body. But even if belief in the continuity of the mass of magnetite is not substantiated by events, still the deposit is a large one.

At No. 3 mine the ore body is 300 feet wide and has been opened for 850 feet. The foot wall at this width is not yet in evidence. A diamond drill core has been taken to the depth of 160 feet. At this depth the ore shows



Open Cut at Bessemer.



Boiler House.

no change. The opening in No. 4 is longer and narrower —1,100 feet by 220 feet. From both mines shipments have been made continuously this summer to the Canada Iron Furnace Company at Midland, Ont., to the "Soo" furnaces and to the Deseronto furnace. Usually these shipments average more than 55 per cent. metallic iron, from 0.01 to 0.07 per cent. sulphur, and from a trace to 0.03 per cent. phosphorus. But shipments of over 100 tons have been made in which the metallic iron averaged more than 63 per cent.

At No. 2 mine, at Child's mine, two and a half miles northeast, and at several intermediate points, development work has been done, more with a view to proving the properties than for shipment purposes, although several shipments have been made.

Near No. 4 mine a substantial power plant has been erected. Here also a shaft house and head frame have been built, in which is installed a large gyratory crusher, capable of crushing 1,000 tons of ore per shift. Both No. 4 and No. 3 mines are worked as open pits; but at No. 4 pit a shaft is being sunk to the dip. The ore from the No. 4 pit trams is dumped into a two ton skip. The ore from No. 3 is dumped into bins, and thence into the skip. The skip is hoisted on a trackway at an incline of about



Skip-way, Crusher and Power House



No. 4 Mine.

60 degrees, and is dumped directly into the capacious crusher. At present only one skip is in service, but a double skipway is laid and as soon as the shaft has been sunk to a suitable depth two skips will be run. The shaft will greatly increase the present output of the mines, which is about 300 tons per day.

Work is continued night and day at Bessemer. Light is supplied during the night shift at the shaft house by powerful gasoline gas lamps.

Large quantities of low grade ore are encountered at No. 4 mine and north to Child's mine. The iron content of these bodies varies between 30 per cent. and 50 per cent., the greater portion of it carrying between 45 per cent. and 50 per cent. To render this marketable it is proposed to erect a concentrator. This will also take care of the waste ore culled from high grade shipments. The basic idea of this is not an expensive and elaborate treatment of the ore; but a rought commercial sizing and magnetic cobbing.

Before passing to another phase of this enterprise it may be mentioned that the writer was shown a curious segregation of apatite crystals on the wall of a fissure near No. 3 mine.

Extending across four lots of the Mineral Range Iron Mining Company's territory is a fine ledge of white, pink and green marble. Negotiations are now pending for the sale of the mining rights of this marble. The writer was shown a beautiful specimen of the polished stone.

In addition to their mining areas, the company owns 10,000 acres of timber lands, a large portion of which is well timbered with cedar, basswood, spruce, tamarack, hemlock, birch, elm, ash and oak. A large saw mill is kept busy with the season's cut.

A small laboratory is now in working order. A shop, offices and many dwellings have been built. The spur line to the Central Ontario Railway is being carefully ballasted and a roadway has been surveyed and partially graded as far as Child's mine.

The Mineral Range Iron Company, Limited, was organized in 1902 by Mr. H. C. Farnum, who is the treasurer and general manager. Mr. E. V. Voigt, of Detroit, is president, and Mr. H. L. Bingham is secretary. The capital of the company is $500,000, divided into shares of $1 each. One hundred and fifty thousand shares are held by the public. The writer wishes to thank the officials of the company for much kindness shown him when he recently visited Bessemer.



Saw Mill at Bessemer.

WILD CATS AND THE PUBLIC PRESS.

CHAPTER I.

A Protest.

The Toronto daily papers, with the notable exception of the *Evening Telegram*, are still publishing the misleading and unlawful advertisements of mining promoters. In our last issue we deal with an advertisement carried by the *Toronto World*. We shall now animadvert upon a similar and even more offensive paid advertisement appearing in the *Toronto Globe* of Wednesday, October 2nd, 1907. On page 2 of that number Law & Company occupy more than half a page with an advertisement of "Highland Mary."

Of the merits of "Highland Mary" as a mining property we shall have more to say in a latter issue. This much may be postulated, however. There is no proved property in Larder Lake. The district may have success, may enjoy prosperity, when the fakirs and leeches are removed from its boundaries. But such things as "Highland Mary," unproved, undeveloped areas, staked for the sole purpose of getting into the pockets of the uninformed masses, are the most effective drawbacks to development.

The points claiming our immediate attention are the advertisement itself and the responsibility of the *Globe* and of Law & Company respectively for the appearance of such an agglomeration of extravagant and flamboyant fiction.

A few excerpts from the advertisements will give the reader an idea of the nature of Law & Company's announcement. A heavily featured proclamation that 250,000 shares were disposed of during the first eight days of sale and that applications are increasing daily is succeeded by some clap-trap advising the public not to gamble. The same public is then enjoined to purchase "Highland Mary" at 10 cents per share. This they can do with the certainty that, on the honor of Law & Company, Limited, they will receive "an income that will each year exceed the total amount of the investment." Among other sad features of this promotion, the above implies that already Law & Company have sold at least 250,000 shares of "Highland Mary" at 10 cents per share, totalling $25,000. "Highland Mary" is an undeveloped prospect. Law & Company's acquaintance with legitimate mining is at once discounted by their willingness to make such promises as that quoted above. With the assistance of the daily press they are, however, pushing "Highland Mary" upon the market. They are trying to convince the unfortunately credulous public that "Highland Mary" will "make stockholders rich." As usual, they predict a "big advance" in the price of shares. Surely Law & Company, boasting "seventeen years of unfailing business integrity," could afford to dispense with this last hall-mark of unsanitary stock promotion.

It is now in order to look at the "Highland Mary" advertisement of Law & Company in the light of the

Ontario Companies' Act. Section 94 of this Act defines the word "prospectus" as meaning "any prospectus, notice, circular, *advertisement* or other invitation offering for subscription or purchase any shares, debentures or other securities of a company, or published or issued for the purpose of being used to promote or aid in the subscription or purchase of such shares, debentures or securities, and the word 'company' shall mean *any company incorporated or proposed to be incorporated.*"

Section 99 outlines what is to be disclosed in any prospectus. The only exception made in the case of an advertisement is that the names of the original incorporators and the number of shares subscribed for by them need not be specified. Otherwise an advertisement is regarded as a prospectus and the same penalties are provided to punish irregularities.

We find then that the advertisement of Law & Company in the *Toronto Globe* of Wednesday, October 2nd, 1907, makes no mention of the consideration for purchase. This is distinctly required by the Act.

Neither the amount of preliminary expenses, nor the promoters' remuneration, nor the particulars as to material contracts, nor the names of the company's auditors are to be found. The publication of this advertisement is therefore a reckless breach of the law of the land. But it is more and worse than this.

Like "Big Ben" of fragrant memory, the promoters of "Highland Mary," while they mention that they hold 1,000,000 treasurery shares for development purposes (as against 2,000,000 shares obviously not for development) do not specify which variety they are selling. The assumption therefore is that they are not selling treasury stock, and "Highland Mary" may well be described as a sure source of income to Law & Company, Limited, the worthy promoters of that Celtic damsel.

But, to be brief, many things that investors have a right to know and must of necessity know before they can intelligently buy a cent's worth of mining stock are entirely absent from Law & Company's public announcement. Therefore we urge the itching speculator to get a copy of the Ontario Companies' Act. Let him therefrom learn in what respects Law & Company disregard and evade that Act. Then let him respectfully but firmly insist that Law & Company give him all the particulars of every transaction and agreement incidental to the promotion of "Highland Mary"—particulars which in all decency should be fully revealed to the public before a share is sold.

Finally let the possible purchaser remember that a prospect, an undeveloped claim, in Larder Lake is no more than a mere speculative venture in a district of which far too much has been said and of which far too little is known. Law & Company's assurance about the richness of the camp, their quotations of assay results, are so worthless that they need not enter into the discussion.

Referring to the *Globe*, in which this advertisement appeared, we wish to express our unqualified disapproval of the manner in which that newspaper sells its moral support to such wild ventures as that instanced above. Lately the Province of Ontario welcomed a group of British journalists. These men, writers and publicists of a high class, spoke in no uncertain tones of the almost irreparable injury done to Northern Ontario by the unsavory mining schemes which have been and are being floated in the Motherland. They most impressively advised the press and the people of Ontario to discourage such iniquitous phases of frenzied finance.

The *Globe*, admittedly one of the foremost journals of Canada, owes a duty to the public from whom it receives its support. It cannot publish unlawful and misleading advertisements for a money consideration and hope to escape the consequent stigma. In seeming and in truth the paper that continues to publish fraudulent advertising matter makes itself a friend and ally of wild cats. Let us remind the *Globe* that a lofty moral tone and dishonest advertisements, like oil and water, are not miscible. The *Globe* must either adjust the moral plane of its editorials to the level of Law & Company, or exclude all such vicious advertisements from its columns.

CHAPTER II.

An Illustration.

It was in the early spring of this year that Arthur G. Penman, managing director of Penman & Spraug, Limited, Toronto, organized a syndicate to purchase frome Rinaldo McConnell, of Ottawa, a mining property situated on the south half of the southeast quarter of the north half of lot No. 5, concession 4, District of Nipissing, Province of Ontario. The members of the syndicate were chosen with a good deal of discrimination. Many of them were men prominent in political and commercial life. After an option had been secured and a company organized mining rights on the property specified above were purchased for about $50,000.

The name chosen for the company was "The Cobalt Silver Mountain Mining Company."

Mr. Penman appears to have exercised much more sagacity in the selection of his directors and officers than in the choice of his mining location. True, the latter is a very secondary consideration to the average advertising promoter. But we fear that Mr. Penman might well have investigated his property and his title with slightly greater caution.

Mr. Penman, realizing to the full the necessity of having an attractive lot of officers and directors, induced a very prominent politician to act as president of the new company. Fate intervened and carried off this president to another sphere of activity. With no loss of time Mr. Penman then fixed upon E. Guss Porter, Esq., of Belleville, Ont., member of the Dominion Parliament for West Hastings.

Apparently Mr. Penman's imagination and his sense of social discrimination were the only faculties brought into play in these preliminaries. Neither common sense, business acumen nor everyday honesty was evident in the handling and flotation of the company.

The syndicate was formed, the company was organized and shares were sold on the understanding that about nineteen acres of favorably situated mining lands were to be the property of the company. It presently developed, however, that only eleven acres could be patented. Suit was entered by the company against McConnell for the recovery of part of the purchase price. The suit is still dragging on. Money, sorely needed to explore the eleven acres has been, perforce, applied to legal expenses. The position of the company financially is practically hopeless.

Superficially this might appear to call for sympathy. Actually it is an example of a typical mining swindle dying a natural death. A plausible and unscrupulous youth, who certainly knew what he was doing, and whose only aim was to sell the public a doubtful mining claim at an unreasonable figure, induced a number of citizens to help him form a syndicate. The prospectus filed is

fraudulent, and the whole method of flotation was designed to enrich Mr. Penman and his associates. The latter may have been victims of Mr. Penman's wiles; but in effect and in law they are his confederates.

The net results of the prom tion of the Cobalt Silver Mountain Mining Company are that the syndicate is out the purchase price of the areas, and that the property has never, and probably never will under the present regime, ship a car load of ore. It has on its hands a costly law suit, eleven acres of mining claims and a reputation that needs disinfecting.

And now we may point our moral. The *Sunday World* early last spring printed a portrait of A. G. Penman, to whom it referred in terms of warm appreciation. Photographs of a trench on the Cobalt Silver Mountain Company's property also appeared and the whole scheme was given a large amount of prominence.

Despite the *World* and Mr. Penman, notwithstanding puffs and prospectuses, the company has failed dismally to do anything more than enrich one or two personal bank accounts at the expense of a number of others.

Thus the reader of the *Toronto World* or of any other newspaper, when he glances over the fat assurances of Messrs. Law & Company regarding "Highland Mary," may well reflect upon the sad fate of the Cobalt Silver Mountain Mining Company, Limited, of which Mr. Arthur G. Penman is managing director and Mr. E. Guss Porter, M.P., president. Cobalt Silver Mountain started life with all the accessories of such schemes—newspaper puffs, dazzling promises and doubtful methods. A bitter legacy of trouble is the principal result of nearly a year of existence. "Highland Hary" begins lifs with even more glowing promises. The smash, when it comes, will be proportionately greater. Can a respectable newspaper like the *Globe* afford to identify itself with this sort of thing?

We must not close this article until we have referred to an engineer's report, which is incorporated in the prospectus of the Silver Mountain Mining Company. The report is signed by E. C. Kinswell, M.E., and is a most discreditable performance. We hope for Mr. Kingswell's sake that the letters "M.E." are not rightfully his. But if Mr. Kingswell is a graduate of a technical college and can claim the right to his title, he was then deliberately sinning against light and knowledge in concocting such a mass of mischievous nonsense.

THE NOMENCLATURE OF IRON AND STEEL.*

In 1901 the International Association for Testing Materials appointed an influential committee to establish uniform nomenclature for iron and steel. The committee comprised Professor H. M. Howe (New York), chairman; Mr. L. Lévy (Paris), and Professor D. Tschernoff (St. Petersburg), vice-chairman; Professor A. Sauveur (Harvard), secretary, and seventeen members, including Messrs. E. P. Martin, A. Pourcel, H. Wedding, and H. H. Campbell. The report was presented by Professors H. M. Howe and A. Sauveur at the Brussels Congress of the International Association, and it was proposed that the report be submitted to the Iron and Steel Institute for consideration. The Council would, therefore, be pleased to receive written comments for publication in the Journal.

*Paper read before the Iron and Steel Institute.

The report gave the following definitions:—

Alloy Cast Irons.—Those which owe their properties chiefly to the presence of an element (or elements) other than carbon.

Alloy Steels.—Those which owe their properties chiefly to the presence of an element (or elements) other than carbon.

Basic Pig Iron.—In America, pig iron containing so little silicon and sulphur that it is suited for easy con version into steel by the basic open-hearth process. It is restricted to pig iron containing not more than 1.00 per cent. of silicon.

Bessemer Pig Iron.—That which contains so little phosphorus and sulphur that it can be used by itself for conversion into steel by the original or acid Bessemer process. In America, this term is restricted to pig iron containing not more than 0.10 per cent. of phosphorus.

Bessemer Steel.—Steel made by the Bessemer process, whether its carbon content is high, low, or intermediate.

Blister Steel.—Steel made by carburising wrought iron by heating it in contact carbonaceous matter. It might also be made by so carburising a low-carbon steel.

Cast Iron.—Generically, iron containing so much carbon, or its equivalent, that it is not malleable at any temperature. Specifically, cast iron in the form of castings, other than pigs, or remelted cast iron suitable for casting into such castings, as distinguished from pig iron, *i.e.*, cast iron in pigs, etc. (See Pig Iron.) The committee recommends drawing the line between cast iron and steel at 2.20 per cent. carbon, for the reason that this appears from the results of Carpenter and Keeling to be the critical percentage of carbon corresponding to the point "a" in the diagrams of Roberts-Austen and Roozeboom. As to the significance of this critical point, the committee is not prepared to express an opinion.

Cast Steel.—The same as crucible steel; obsolescent, and to be avoided because confusing, and because it offers a temptation to fraud.

Cemented Steel.—The same as blister steel.

Charcoal Hearth Cast Iron.—Cast iron which has had its silicon and usually its phosphorus removed in the charcoal hearth, but still contains so much carbon as to be distinctly cast iron.

Converted Steel.—The same as blister steel.

Crucible Steel.—Steel made by the crucible process, whether its carbon content is high, low, or intermediate.

Grey Pig Iron and Grey Cast Iron.—Pig iron and cast iron in the fracture of which the iron itself is nearly, or quite, concealed by graphite, so that the fracture has the grey color of graphite.

Haematite Pig Iron.—Originally pig iron made from the haematite ores of England, which happen to be so free from phosphorus and sulphur that the pig iron made from them can be used by itself for the acid-Bessemer process. By association, it has come to mean any pig iron thus relatively free from phosphorus and sulphur. The term is not used in America, and is undesirable.

Hot Metal or Direct Metal.—The molten cast iron from the blast furnace before it has been allowed to solidify.

Ingot Iron.—Steel cast into an initially malleable mass and containing so little carbon or its equivalent that it does not harden greatly on sudden cooling. The word is rarely used in England, "mild steel" or "low-carbon steel" or "soft steel" being generally used in its place. In America, the line between soft steel and half-hard steel is usually drawn at a carbon content of about 0.20 per cent.

Ingot Steel.—Steel cast into an initially malleable mass and containing so much carbon or its equivalent that it hardens greatly on sudden cooling. The word is rarely used in England, but "hard steel," "high-carbon steel," or "half-hard steel" are used in its place.

Malleable Castings.—Castings of malleable iron, which see.

Malleable Cast Iron.—Iron which, when first made, is cast in the condition of cast iron, and is made malleable by subsequent treatment without fusion. Although the English name of this variety suggests that it is cast iron, it is not truly a variety of cast iron, but rather forms an independent species of iron, because it lacks the essential property of cast iron, viz., its extreme brittleness. Though the term "malleable castings" is very common, the term "malleable cast iron" is very rarely used. The common but inexcusable term, we regret to say, is "malleable," pronounced "mallable," used as a substantive.

Malleable Iron.—The same as wrought iron. Used in Great Britain, but not in the United States, except carelessly, as meaning "malleable cast iron."

Malleable Pig Iron.—An American trade name for the pig iron suitable for converting into malleable castings through the process of melting, treating when molten, casting in a brittle state, and then making malleable without remelting. The term should be used with care to avoid confusion. This material is so called in trade in America "malleable iron"; but this use should be avoided, because "malleable iron" has the older and (in Great Britain) firmly established meaning of "wrought iron."

Mottled Pig Iron and Mottled Cast Iron.—Pig iron and cast iron, the structure of which is mottled, with white parts in which no graphite is seen, and grey parts in which graphite is seen.

Open-hearth Steel.—Steel made by the open-hearth process, whether its carbon content is high, low, or intermediate.

Pig Iron.— Cast iron which has been cast into pigs direct from the blast furnace. This name is also applied to molten cast iron which is about to be so cast into pigs, or is in a condition in which it could be readily cast into pigs.

Plate Iron.—A name applied in Great Britain to refined cast iron.

Puddled Iron.—Wrought iron made by the puddling process.

Puddled Steel.—Steel made by the puddling process, and necessarily slag-bearing. (See Weld Steel.)

Refined Cast Iron.—Cast iron which has had most of its silicon removed in the refinery furnace, but still contains so much carbon as to be distinctly cast iron.

Shear Steel.—Steel, usually in the form of bars, made from blister steel by shearing it into short lengths, piling, and welding these by rolling or hammering them at a welding heat. If this process of shearing, piling, &c., is repeated, the product is called "double shear steel."

Steel.—Iron which is malleable at least in some one range of temperature, and in addition is either (a) cast into an initially malleable mass; or (b) is capable ob hardening greatly by sudden cooling; or (c) is both so cast and so capable of hardening. Variety *a* includes also molten iron, which, if cast, would be malleable, as do its two sub-varieties, "ingot-iron" and "ingot-steel." (Tungsten steel is malleable only when red hot.)

Steel-Cast (adjective).—Consisting of solid Bessemer, open-hearth, crucible, or other slagless steel, and neither forged nor rolled; applied to steel castins. For instance, a "steel-cast" gun is a gun which is a steel casting, *i.e.* which has been neither forged nor rolled. To call it a "cast-steel" gun would imply that it was made of crucible steel, to which the term "cast-steel" is restricted.

Steel Castings.—Unforged and unrolled castings made of Bessemer, open-hearth, crucible, or any ther steel. Ingots and pigs are, in a sense, castings; the term "steel-castings" is used in a more restricted sense, excluding ingots and pigs, and including only specially shaped castings, such as are generally used without forging or rolling. They may, however, later be forged, *e.g.* under the drop press, when they cease to be "castings" and become "drop-forgings," or, if only part is forged, then they are partly forgings and partly castings.

Washed Metal.—Cast iron from which most of the silicon and phosphorus have been removed by the Bell-Krupp process without removing much of the carbon, so that it still contains enough carbon to be classed as cast iron. The name "washed metal" is extended to cover this product even if its carbon is somewhat below the proper limit for cast iron.

Weld Iron.—The same as wrought iron. Obsolescent and needless.

Weld Steel.—Iron containing sufficient carbon to be capable of hardening greatly by sudden cooling, and in addition slag-bearing, because made by welding together pasty particles of metal in a bath of slag, as in puddling, and not later freed from that slag by melting. The term is rarely used.

White Pig Iron and Wuite Cast Iron.—Pig iron and cast iron in the fracture of which little or no graphite is visible, so that their fracture is silvery and white.

Wrought Iron.—Slag-bearing, malleable iron, which does not harden materially when suddenly cooled.

Wrought Steel.—The same as weld steel. Rarely used.

The following are definitions of names designating special sizes or shapes of iron and steel:—

Bar Iron.—Wrought iron in the form of bars, rods, &c.

Muck Bar.—The rough bars, usually 1 inch thick and about 4 inches wide, made by the first rolling of a ball of puddled iron.

Merchant Bar.—Wrought iron in the form of merchantable bars or rods made by shearing muck bar into short lengths, piling it and rolling or forging it at a welding heat.

Bloom.—1. A large bar, drawn from an ingot or similar mass, for further manufacture. 2. A rough bar of wrought iron drawn form a Catalan or bloomery ball for further manufacture.

Billet.—A small bar drawn from a pile, bloom, or ingot for further manufacture. The committee recommends that the line between blooms and billets be drawn at the size of 5 inches square, as representing common custom.

Slab.—A flat piece or plate, with its largest surfaces plane, or sheared from an ingot or like mass for further treatment.

In conclusion, the view is expressed that it would be well to decide on a definite carbon content to serve as a boundary line between ingot ironand ingot steel, between puddled iron and puddled steel, and between any other varieties of wrought iron and weld steel. Two plans have been considered. One is to draw this line at 0.32 per cent. carbon or its equivalent in other elements, for the reason that this carbon content appears to correspond to the critical point O in the diagrams of Roberts-Austen

and Roozeboom. This has the merit of corresponding to a definite physical boundary. The other plan is to draw the boundary at 0.20 per cent. of carbon, because this is a convenient place to separate the important classes "soft steel" and "half-hard steel," so that if this point was adopted "ingot iron" would be synonymous with "soft steel," and "ingot steel" would be equivalent of the two classes "half-hard steel" and "hard steel."

The report was received and adopted by the Congress, and the committee was requested to continue their labors with a view to securing the foreign equivalents to the terms defined.

THE DEVELOPMENT OF AN ORE SHOOT IN NOVA SCOTIA.[1]

By E. Percy Brown, B.Sc., Goldboro, N.S.

(Read 28th March, 1907.)

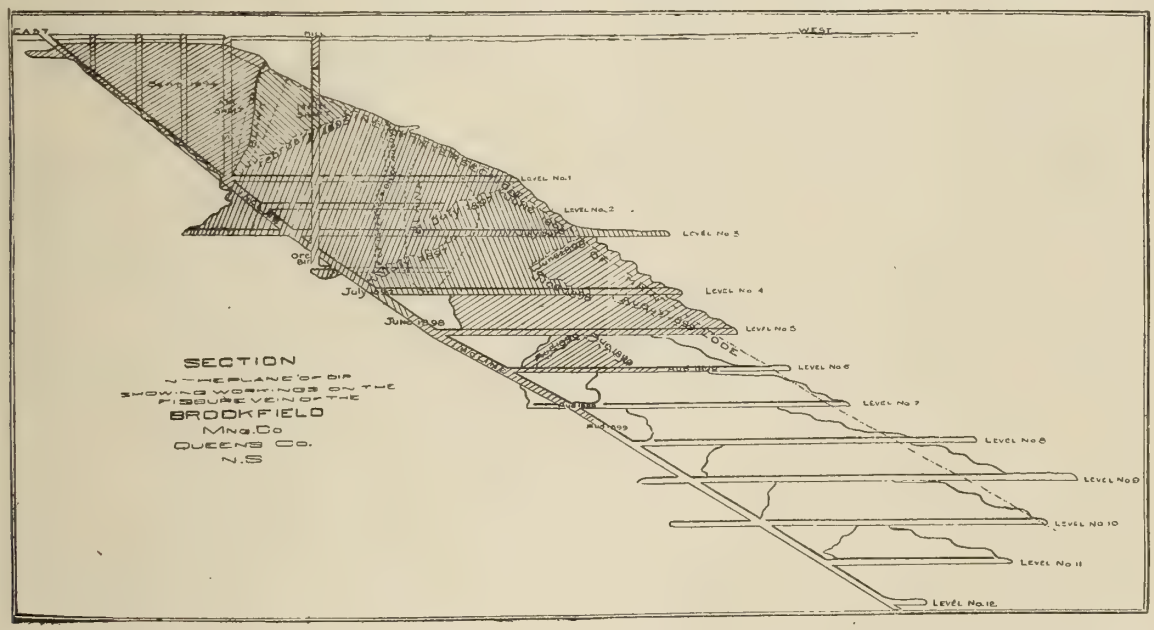
Looking over the history of mining in Nova Scotia, one is struck by the large number of properties which, though proved phenomenally rich on the surface, have been abandoned after a rocket-like career of one or two years. The depth usually reached has not been great, two hundred to three hundred feet being the average. In many cases it has been less, in a few cases more, and two reached the depth of one thousand feet.

In almost all instances where any really successful mining has been done in Nova Scotia, a "shoot" or chimney of rich ore has been successfully followed and the poorer portions of the vein neglected. And it is well to note that Nova Scotia is not exceptional in this respect. If the reader will consider, he will find that the majority of the richest gold mines in the world have been of this class. The large, uniform, low-grade propositions are the exception rather than the rule.

The objects of this paper are three-fold: (1) To give in brief outline the history of a certain gold mine in Nova Scotia, showing the similarity of the early history of this mine to the total brief history of many of the richest gold deposits of this Province; (2) to show how, by a happy combination of knowledge, pluck and perseverence, the history of this mine was prolonged; and (3) to indicate the probability that many of the other rich outcrops could be opened up and followed in a similar way.

The property of the Brookfield Mining Company[2] was first opened in 1886. The returns of the mines office for 1887 show that 1,418 ounces of gold were produced from 1,691 tons of quartz. An extreme depth of about 250 feet was reached and the system of mining is shown in the upper left-hand portion of the accompanying sketch. Four shafts were sunk in a distance of about 200 feet and the ore mined out between them by underhand stopping.

This method is recognized by anyone familiar with mining practice in Nova Scotia as the method almost universal in this Province until a few years ago, and it is important to note in this connection how peculiarly well adapted to closing down a mine is such a system.



No development work, such as levels and shafts, was carried ahead, and if a blank or poor portion of the ore-body occurred, particularly if it occurred as in the case under consideration, all the stopes would likely be in it at the same time, seeming to justify the belief of the superficial observer that the vein had absolutely "petered out."

The four shafts were sunk while they were in pay ore and the line of stopes carried ahead until they had reached the position shown in the sketch. Another shaft was sunk about 120 feet further west, but not reaching

[1]Paper read before the Nova Scotia Mining Society.
[2]At Brookfield, Queen's County, N.S.

ore at a depth of about 60 feet, it too was discontinued. Thus no ore was visible in any of the shafts or on the stopes, and the mine was abandoned.

The plan of the Brookfield mine at this time might stand almost unaltered for the underground plans of dozens of abandoned mines in Nova Scotia to-day. Many of these have given high returns for a year or two; many shafts have been sun, the rich ore and handsome specimens being dug out between them; managers, assistant managers, superintendents, etc., have enjoyed good salaries; many miners have made small fortunes by stealing rich nuggets; until the day has come, as in the above case, when all the shafts were bottomed in barren ground, the stopes were black and the mine was closed down, leaving an indignant body of stockholders to mourn their loss and blame the gold measures of Nova Scotia.

In September, 1894, this mine was pumped out by Mr. W. L. Libbey, who had for underground foreman Mr. C. N. Crowe. Mr. Crowe had had experience outside of Nova Scotia and appreciated the fact that an ore body as rich as this had proved was not likely to be an isolated bunch. He had seen pay shoots found and followed in other countries, and "hulk seams," even when no thicker than a knife blade, chased through blanks to rich bodies of ore. Such a hulk seam existed here, and certain corrugations on the vein walls, together with the dip of angulars, etc., indicated the direction to take.

A main or interstratified vein, intersecting the Libbey "fissure" in strike and dip, appeared to cut off the latter vein and to form the upper limit of the pay shoot. The stopes in the eastern end of the mine were found to be practically on the lower limit of the ore. A drift was started westwardly from about the point A. Within a month rich quartz was encountered and in less than three months the mine was on a handsomely paying basis, yielding larger returns than it had in its early days. The blank portion of the vein in the western end of the mine was proved to be small and the stopes were pushed ahead through it. The sketch shows the condition of the mine in February, 1895.

The limit of the pay shoot, having thus been established, it becames necessary to outline a plan for its economical development. An incline was run along the lower edge of the pay shoot, levels driven at intervals across the ore body, and the ore stoped out between them. The outline marked July, 1895, shows this system.

The wisdom of Mr. Libbey's plan of development has been frequently questioned. It seems to me, however, that, where a rich chimney of ore has been proved to exist in a narrow, irregular vein, the secret of successful mining lies in getting in touch with the ore and staying with it wherever it may lead.

There are many examples in Nova Scotia where the other plan, viz., sinking vertical shafts, has been tried and proved a failure. Certainly Mr. Libbey's system was well tested during the year 1897, when a blank portion of the vein was again encountered, and though this blank was much larger than the former one, pluck and perseverence won the day and the mine kept pushing ahead.

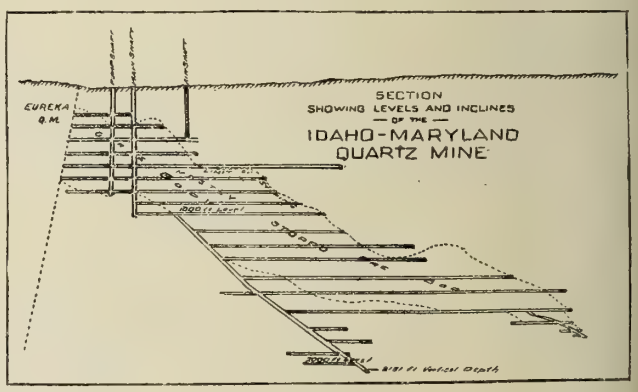
During the next year, as may be seen from the sketch (marked June, 1898) the system of the stoping was gradually changed from underhand to overhand. The results of the adoption of this system may be seen by the outlines marked August, 1899, when development work had been pushed ahead and ore reserves had been blocked out.

The further workings explain themselves and are shown up to February, 1903.

Such is a brief outline of a portion of the history of the development of an ore chimney in Nova Scotia. To show that similar ore bodies occur elsewhere, the reader is referred to the accompanying sketch on a small scale of the Idaho Maryland quartz mine. This shows the development of an ore chimney to a vertical depth of over 2,000 feet, and it is interesting to note the poor system of development: a vertical shaft for 1,000 feet, and levels and inclines form there to the bottom.

Is there any reason to suppose that many of the other deposits of the ore referred to in the first portion of this paper, and proved so rich on the surface, could not be successfully followed in the same manner as has been done by the Brookfield Mining Company? I hold that there is every reason to suppose that many, if not all of them, could be so opened up.

Mr. E. R. Faribault, of the Dominion Geological Survey, has performed a great deal of very valuable work in most of the gold mining districts of the Province, and such work properly applied would be of the greatest assistance in opening up these abandoned mines. A careful survey and mapping of the old workings, to-



gether with accurate sampling by mill tests from all parts of the mine, and a careful study of the geological and mineralogical conditions prevailing in the underground workings, should establish the probable location and direction of the pay shoot.

The great difficulty which at the outset confronts the man who has confidence in the gold measures of Nova Scotia, and the means to prove it, is that these properties are mostly held by persons who, though not willing to work them themselves, either through lack of confidence or lack of means, demand as high a figure for the property as though it were on a dividend-paying basis. They cannot be made to sell, and easily afford to pay the small sum of fifty cents per annum for each area they wish to hold. Thus are most of the mining properties in Nova Scotia tied up. The result is stagnation in the mining industry. The Government of Nova Scotia has shown its willingness to co-operate with the mining fraternity to overcome this stagnation; but with so large a proportion of the desirable properties tied up as they are at present, it is difficult to effect much lasting good. It would seem that the remedy must lie with the mining laws. The measures necessary may seem harsh, but the present crisis would seem to call for prompt and decisive action.

NOTES FROM A TRAVELLING CORRESPONDENT.

Next to the labor question there is no topic at the moment more universally discussed in the West than the "fuel situation" and the alleged coke shortage. Every man you meet in the Kootenays has something to say on the matter and that say is usually more or less emphatic and forcibe. Generally speaking the Crow's Nest Pass Coal Company gets the major proportion of the damning, and the coloring may be fairly accurately determined by the Associated Press despatches of recent date. Unfortunately, however, the suspicion that these despatches are not entirely uninspired somewhat weakens their effect locally, and your Eastern readers may very comfortably accept all the telegraphic news bearing on the subject with tongue in cheek. It is true, of course, that there has been a coke shortage, and that in consequence output in Rossland and Boundary has been, during the past three months, restricted thereby. But it is not true that the Crow's Nest Pass Coal Company is responsible for that shortage, or has, as is alleged, unfairly discriminated against local reduction works in favor of other customers in the United States. The fact is the situation has arisen from a variety of circumstances, not the least contributory of which was the quite unnecessary and impolitic action of one of the large undertakings in the Boundary in increasing wages at mine and smelter early this summer. Just at that time labor was by no means plentiful. The rise of wages at one centre upset the equilibrium elsewhere. The price at which coke is sold to local consumers—$4.50 a ton—does not admit of any considerable addition to the cost of production, such as an all-round increase in wages would, and so men left the colliery in numbers to secure employment in the more remunerative camps of West Kootenay and Yale. The work of drawing coke ovens is at all times hard; during the hot days of summer it can only be borne by the strongest. Men were brought in to replace those who had left, but only to stay a shift or two and then depart. Here was one very real reason for output shortage. Another, none the less tangible, was the absolute inability of the Canadian Pacific Railway to supply cars and engines. The company did not treat the colliery less prejudiciously in this respect than it did the mines and smelters, for the complaint on the score of transportation inadequacies is general in the metal mining districts to this day. The fact remains, however, that the operations of the colliery company were seriously handicapped this summer by car shortage, and scarcely a week passed when it was possible to work either the mines or ovens to full capacity. No allowance for these limitations is made by those critics of the Crow's Nest Pass Coal Company's management, who are now claiming that the shortage of fuel in British Columbia is due to a large exportation this season of coal and coke to Montana and other United States smelters. The truth or otherwise of this contention will doubtless be shown from the evidence which may be demanded by the Arbitration Board appointed by the Provincial Government to investigate the question; but I am in a position to state that only during the month of July, when some of the British Columbia smelters reduced their orders and all were "stocked up," did the colliery's American customers receive, and that only in one instance, a percentage of coke or coal on their orders in proportion to the tonnage required by and supplied to Canadian consumers. In August shipments to the United States were considerably curtailed, and in September practically ceased altogether. Of course there is no use denying that the position of the company is not altogether a happy one. It stands between the Charybdis of the C. P. R. and the Scylla of the Northern Pacific. It is a case of pull baker, pull devil, and somebody necessarily has to get the worst of it. Meanwhile the effort that has been made by one side to close the Northport smelter by inducing the Provincial Government to use its alleged prerogative to prevent the export of coke for use at these works has, I am glad to learn, proved ineffectual, the authorities recognizing that any such action would necessarily be regarded by all fair-minded people as arbitrary in the extreme and calculated to injure a British company operating at heavy expense in the Province, employing a large number of men and therefore entitled to every consideration. I am not saying that it would be a bad thing for the Le Roi Company if the Northport smelter were compelled to close down; on the contrary it would, I believe, be the very best thing that could happen from every point of view; but the shareholders should at lesat have another chance to find that out for themselves, and perhaps in a subsequent letter I may present a few facts for their consideration in this regard. Meanwhile the crisis as far as concerning immediate fuel requirements appears to have passed. Both cars and labor are now plentiful, and the colliery is now, therefore, in a better position to cope with the situation. It has promised to supply the British Columbia Copper Company's requirements in full, while the Granby, to make sure of a preference, has stepped in and by the investment of from half to three-quarters of a million dollars in Crow's Nest Pass shares claims to have secured the balance of power between the two big interests. At any rate Granby interests will be well looked after by Mr. Groves, whose recent election on the Crow's Nest directorate is portentous. Finally, the C. P. R. is proceeding rapidly with the development of its coal areas at Hosmer, which in a year or so's time should be placed on a productive footing. At least, so it is hoped.

H. M.-L.

The Geological Survey's determination of the highest and lowest land in the United States is a fresh reminder of the smallness of the vertical range of the habitable globe. These points are both in Southern California, only 75 miles apart, Mt. Whitney reaching a foot or two over 14,500 feet above sea level, while Death Valley sinks 276 feet below that level.

A new electric furnace, for determining the fusion points of refractory substances, has been constructed at Hanau by W. C. Heraeus. Its essential part is a tube of iridium four-fifths of an inch thick and an inch and three-fifths in diameter, and in this temperatures between 1500 and 2000 degrees C. can be maintained for any desired length of time.

The *Iron and Coal Trades Review*, September 20th, attributes the fall in metal prices to the readjustment of supply and demand. Readustment has been made more difficult by "unrest, depression and lack of confidence in the business and financial world, "particularly in the case of copper and tin. Decreased consumption without any corresponding decline of output explains the price movements of lead and spelter.

THE ERZBERG OF EISENERZ.*

By H. Bauerman (London).

The Erzberg or Ore Mountain of Eisenerz is the largest of a series of mineral deposits associated with the Palæozoic rocks of the Eastern Alps on their northern slope, which extends from the Tyrol on the west to the margin of the Vienna basin in the east, a distance of nearly two hundred miles. These deposits, although following the same general direction, are irregularly distributed and vary very considerably both in size and in their contained minerals of value, some of them, to mention only those of the immediate vicinity, having been worked as copper mines in the district west of Eisenerz, at Kallwang, Radmer, and Johnsbach, from the year 1546 to the middle of the nineteenth century, one of them having produced about 150 tons of copper annually for a century. At present, however, only the iron ore and magnesite deposits are of importance, and among the former the Erzberg takes an exclusively prominent position.

The geological structure of the Eisenerz region is shown in a general way in the sketch map, Plate I., in the preparation of which the author has been kindly assisted by Professor von Ehrenwerth and Professor Dr. Redlich of Leoben. The southern part of the area is made up of granular and schistose rocks (grauwacke) and heavy masses of limestone with a general east and west strike, and dipping at high angles to north and northeast, which are overlain unconformably by the great masses of the Triassic formations constituting the northern limestone Alps, commencing with the Ferfen series of the lower Trias, red sandstone schists and gypsum beds, and followed by the limestones and dolomites of the Muschelkalk (Wetterstein Dachstein, etc.), forming the mountain masses of the Hochschwab, and extending to the Semmering, Raxalp, and Schneeberg districts to the eastward. The change in the formation is marked by a strong contrast in the shape of the ground, the older rocks giving mountains of more rounded outline and well wooded, while the Triassic summits rise in great wall-like cliffs, a striking example being the Pfaffenstein, which dominates the town and valley of Eisenerz and towers above the Erzberg, as shown in Plate II.

Topographically, the Erzberg is a nearly isolated conical mountain overlooking the watershed of the Enns and Mur[1] rivers, the former receiving the northern drainage of the Erzbach at Hieflau, about ten miles to the northwest, and the latter those of the Vordenberg brook, immediately above Loeben, the heigh of the dividing line at the Prebichel summit being 4,026 feet. From its summit, 5,043 feet above the sea level, the Erzberg slopes sharply to the Krumpenthal on the west and Trofeng on the east, a depth of about 3,000 feet in either direction, but to the south the inclination is somewhat less to the Platten ridge, connecting it with the great limestone mass of the Reichenstein, which is about two miles to the south, and 7,108 feet total height.

The iron ore workings are confined to the western side of the mountain, covering about three-quarters of the height, with a horizontal extension of about 1,400 yards. From the Krumpenthal, about 600 feet up the slope, the oldest member of the series, the so-called footwall or base of the ore appears. This is the "Grauwacke," a well-stratified, greenish-grey rock made up of grains of quartz and felspar crystals in a more compact base of potash, mica scales, and some quartz. This is an important rock formation as generally marking the limit between the central crystalline region of the Alps and the limestone mountains of the north. Intimately connected with the grauwacke below the ore bed is a dark grey or black siliceous slate, with inclusions of pyrites and some fossils that are referred to Upper Silurian species.

Following the grauwacke in ascending order is a heavy formation several hundred feet thick, made up of alterations of spathic iron ore, ankerite (rohwand), and a light-colored or variegated yellow and red limestone known as the Sachberg limestone, or the ore-bearing limestone by the older authorities. This contains fossil crinoids of Lower Devonian age.

The ore bed forming the highest member of the series shows a basin-like structure with an included belt of schists, containing sericite, which gives it a soapy feeling to the touch. This, while closely confirming the outline of the ore below it, is so sharply separated from it in character that it is considered by Vacek[2] to mark a division between the ore beds of dissimilar ages, the lower one being assigned to the Devonian and the latter to the Permian period. This view, however, has not been generally accepted, on the ground that no difference in mineral composition can be established between the upper and lower beds, and that the schist may represent an original barren clay parting.

At the summit of the Erzberg, above the iron ore workings on the eastern slope, the grauwacke beds with their associated limestones appear in a vertical position, or in some places with a partially reverse dip, while below, on the Krumpenthal side, the same beds dip into the hill at a lower angle. The ore bed therefore seems to be included in a plain synclinal fold, but the numerous slip faults and other disturbances exposed in the bed by the quarrying operations indicate a more complicated structure resulting from disturbances renewed at several different periods. In all probability, however, it originally formed part of the Silurian and Devonian limestone series, with which it is so intimately associated, and was subsequently transferred into spathic ore at the close of the Palæozoic but before the commencement of the Mesozoic period.

Evidence for the latter is afforded by the overlying red sandstones of the Werfen series occurring on the eastern side of the mountain, which contain in places at their base, breccias, with fragments of the ore-bearing limestones, marking the commencement of the Triassic formations of the northern limestone Alps. The western side being entirely free from newer overlying strata, the ore bed is exposed for about three-quarters of the whole length of the slope, on that side giving facilities for working the deposit such as can scarcely be paralleled in other localities.

Another view of the age of the grauwacke is also taken by Vacek, who on petrographical grounds considers it to be the equivalent of the Archæan gneiss of Blas-

*Paper read before the Iron and Steel Institute.

[1]Both rivers join the Danube but a considerable distance apart. The mouth of the Enns is a few miles below Linz, and that of the Drau, of which the Mur is a tributary, about 400 miles further down, at the lower end of the north and south reach of the Danube, through the plain of Hungary.

[2]*Jahrbuch der k. k. geolog. Reichsanstalt*, 1900.

seneck, and that it has been extensively eroded before the deposition of the Devonian limestone formation which therefore covers it unconformably. This, however, is generally contested by other observers.[3]

Spathic ores occur under similar conditions to those of the Erzberg at the Donnersalpe, about three miles west, and on the Polster, two miles east of the main deposit. At the former locality the ores, with associated limestone and ankerite beds, are frob 100 to 120 feet thick, and cover an area of about 700 acres.[4] These, from their position and relation to the overlying Triassic strata, are considered to be the remains of a series of deposits formerly continuous, which have become separated by the erosion of the Erzbach and Gerichtsgraben valleys in post-Triassic times.

The Erzberg ore, when freshly broken, is a fine-grained crystalline spathic ore, which weathers to a rusty brown limonite. The hard uncharged ore is known as Flinz, and in the early days was thrown aside as waste, only the soft brown ore being suitable for reduction in the bloomary furnaces. This was known as Blauerz (blowing-house ore). Another characteristic variety is the so-called Kernflinz, where the spathic ore is altered to limonite externally to a depth of an inch or two, the line of separation between the two minerals being very sharply defined. Mangenese and iron are present in about the proportion of 1 to 16 or 18, or considerably less than in the spathic ores of the Devonian rocks of Siegerland and Somersetshires, where the ratio is 1 to 4 or 5. Unlike the latter, however, the Erzberg ores are remarkably free from the sulphides of other metals, particularly those of copper, which are so very characteristic of spathic ores from other places. Cinnabar (sulphide of mercury) is found as a rarity, together with some iron pyrites, quartz and hæmatite. The most abundant foreign admixtures with the ores are the isomorphous carbonates of lime and magnesia, principally in the form of ankerite or rohwand, which makes up most of the waste material. This is a somewhat indefinite mixture of the different carbonates. As a rule, carbonate of lime predominates, making up about one-half, the remainder being ferrous carbonate with that of magnesia in subordinate quantity. This distinguishes it from Breunnerite, Brownspar, Mesitine, and Pistomacite, which are essentially ferrous and magnesian carbonates without lime. The following analysis of the Erzberg ankerite is due to Reibenschüh[5]:—

	Per Cent.
Ferric oxide	2.29
Ferrous oxide	23.40=$FeCO_3$ 37.75
Manganous oxide	1.69=$MnCO_3$ 2.74
Magnesite	6.08=$MgCO_3$ 12.77
Lime	24.41=$CaCO_3$ 43.58
Carbon dioxide	42.08
Total iron	19.8

Carbonate of lime occurs both as calcite and aragonite. The latter, in the coral-like forms known as *eisenblüthe* or *fios ferri*, is about the best known of the Erzberg minerals. Another form, made of alternating layers of aragonite and calcite, has received the name of Erzbergite.

The composition of the ore, as may be imagined, is subject to considerable variation. According to older analyses of K. von Hauer and Paterer[6] in 1872, the spathic ores ranged between 37 and 42 per cent. iron when raw, and 50 and 59 per cent. when calcined. The brown ores showed a greater range (between 41 and 52 per cent.), owing to the increase of siliceous waste, and for the same reason the increased yield by calcination was not as marked as with the spathic ores.

According to a statement kindly furnished by the Oesterreichische Alpine Montan Gesellschaft, the average composition taken over the whole output at the present time is:—

	Raw Ore. Per cent.	Calcined Ore. Per cent.
Ferric oxide	19.50=Fe 13.65	71.18=Fe 49.83
Ferrous oxide	32.25=Fe 29.08	1.23=Fe 0.85
	38.73	50.68
Manganic oxide	3.50=Mn [3]2.45	4.29=Mn. 3.00
Lime	5.92	6.19
Magnesia	4.06	4.14
Carbon dioxide	27.62	2.64
Water	0.84	0.14
Silica	4.08	8.19
Alumina	1.26	1.61
P_2O_5	0.034=P 0.015	0.059=P 0.025
SO^3	0.202=S 0.079	0.432=S 0.169

From this it appears that about one-fifth of the ore is weakened to the ferric condition, the remainder being made up of carbonates in the following proportions:—

	Per Cent.
$FeCO_3$	51.96
$CaCO_3$	10.61
$MgCO_3$	8.52

The large proportional increase in silica and phosphorous in the calcined ore, both nearly doubled, is probably due to additions supplied by the ash of the small coke used as fuel in the kilns.

The mining of iron ore on the Erzberg has been carried on from very early times. Traditionally the workings date back to the eighth century, but there are no authentic records older than A.D. 931. Under feudal organization the mountain, being considered as the property of the sovereign, grants were made to individual territorial proprietors, known as Radmeister, or wheelmaster, who were not merely owners of the water power, but were required to have sufficient resources in land, forests, and tenants to supply the necessary fuel and labor for effective working without outside assistance. Another condition required the proprietor to be resident. Only by special license from the sovereign was non-residence permitted, and when an aproved agent had been provided. The mining rights were defined in the thirteenth century by dividing the mountain into two parts by a horizontal plane nearly at the level of the Prebichel summit, the part above that plane (the Ebenhöhe), 3,891 feet above the sea level, being assigned to Vordernberg proprietors, and the lower part to those of Eisenerz, an arrangement which is still in force. The diversity of interests between the large number of owners—fourteen in Vordernberg and nineteen in Eisenerz—was attended with great confusion and waste in working the ores, and in 1625 the interests in the lower part were consolidated by the formation of the Inneberger Haupt Gewerkschaft, which, after passing through several changes, was incorporated as a joint stock company under the same name in 1868, subsequently becoming merged, with other principal ironworks in Styria and Carinthia, in the Oesterreichische Alpine Montan Gesellschaft in 1881.

[3] J. Taffanel, *Annales des Mines,* 1903, vol. iv. p. 24.
[4] Aigner, *Die Mineralschätze der Steirmark,* p. 46.
[5] Aigner, *op. cit.* p. 169.
[6] *Ibid.,* p. 166.

The Vordernberg proprietors maintained their individuality for a much longer period. Consolidation of thirteen of the works into the Radmeister Communität took place in 1825, the fourteenth having only joined in 1871. Since 1890, the working of all the mines has been taken over by the Alpine Montan Gesellschaft, who hold 54-84ths of the Vordernberg proprietary rights.

At the time of the former visit of the Institute in 1882, underground mining was still carried out to a considerable extent in the higher part of the mountain in winter, working in the open being confined to the summer, while in the lower ground, open working alone was practised. At that date there were twenty-six quarry faces or terraces on the Eisenerz side, with room for five more up to the Vordernberg boundary; but since 1890 underground mining has been completely abandoned, and the entire face of the deposit has been laid out in a series of steps or terraces, fifty-eight in all, varying in height from 33 to 43 feet, giving a total depth of working faces of about 2,000 feet.[7] The ore, broken by hand-boring and blasting with dynamite and other high explosives, is picked by hand from the waste and carried in trucks by levels driven in from the face to the different distributing shafts and levels in the interior of the mountain. Originally the Vordernberg ores were conveyed by a horse-railway of 3-foot gauge, made in 1835 and converted to steam traction in 1878, on a falling gradient of 1 in 125 to Prebichel, whence the further drop of 1,176 feet to Vordernberg town (the terminal point of the branch railway from Leoben), was covered by a combination of inclined planes and railways; while those of the Innerberg workings were passed out by a deep adit and inclined planes to the Eisenerz terminus of the State line branch from Hieflau. Since the completion of the connecting railway on the Abt centre rack rail system, joining these points across the Prebichel pass, the arrangements have been remodelled upon the principle of collecting the output at three different levels, each one being connected with its own station on the railway. The highest of these, the Wismath main level, 4,164 feet, utilizes the old railway as far as Prebichel station, but the lower part, with the inclined planes to Vordernberg, has been abandoned. The middle section is served by the Drei König stage (3,539 feet), which is connected with Erzberg station (3,511 feet) by an electric railway about 1,200 yards long; and the lowest by the Liedemann adit at the bottom of the workings (2,962 feet), which emerges on the slope about 650 feet above the kiln plant on the Krumpenthal, which is covered by a series of inclined planes, as shown in Plate III. The ores from levels above the collecting planes are lowered by self-acting inclines or cage-drops in shafts, while those from lower levels are hoisted by water-balance lifts. Latterly, electric winding gear has been fitted in the deepest of the drop-shafts, that between the Drei König and Liedemann levels, which enables a portion of the Eisenerz output to be diverted to the Erzberg station when required. From the kilns an electric railway connects with the Eisenerz station and the blast furnace at the north end of the town.

With the improvement of the transport arrangements, the Erzberg output has increased largely. In 1882 it amounted to about half a million tons, 212,000 for the Vordernberg and 250,000 to 300,000 tons from the Eisenerz side. In 1906 it was 1,300,000 tons, about 300,000 tons from Vordernberg and the remainder from Eisenerz workings.

Until past the first half of the nineteenth century, the Erzberg ore was smelted exclusively with charcoal at numerous small furnaces at Hieflau, Eisenerz, Vordernberg and Trofojach, in the vicinity of the mines; but the growing scarcity of charcoal has led to thei ralmost complete abandonment, and out of forty-five furnaces existing in 1882, only four are at work intermittently at the present time—three at Vordernberg, with an output of from 18 to 60 tons each, and one at Trofojach making from 30 to 40 tons per day. The furnace charge is made up of 75 to 80 per cent. of calcined and 20 to 25 per cent. of small raw spathic ore, and 4 to 5 per cent. of siliceous clay flux. The fuel consumption is from 15 to 16 cwts. of charcoal per ton of metal, or, in the most favorable cases, as low as 14 cwt. The product, a low silicon white iron, resembling the plate metal of the West Yorkshire refinery, containing:—

Carbon	Silicon	Manganese	Sulphur	Phosphorus
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
3.57	0.25	1.37	0.04	0.04

goes usually for crucible steel making.

Smelting the Erzberg ore with coke on the large scale was commenced with a pair of furnaces at Klein Schwechat, near Vienna, the fuel being brought by rail from Moravia; but these are not now at work, the main smelting operations being conducted at Donawitz, near Leoben, and Eisenerz. At the former place the number of furnaces has been increased to four, the two earlier ones having cage lifts and hand-filling, while the newer pair have inclined lifts and self-tipping charging skips. The materials smelted are calcined spathic ores, heating furnace slags, and mill scale and limestone. The coke used is mostly Westphalian, with some from Ostrau in Moravia, the consumption being about 18 cwts. per ton. The daily make is about 300 tons; the slag produced, 16.8 cwt. per ton, is granulated and thrown into the brook to be washed away during floods. The Eisenerz furnace is larger and makes over 400 tons daily. The range in composition of the metal is:—

Carbon	Manganese	Silicon	Sulphur	Phosphorus
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
3.0-3.8	2.2-2.8	0.5-0.7	0.04-0.08	0.05-0.10

Formerly Donawitz was a puddling forge, the furnaces being fired with the miocene lignite from the mines in the hills above Leoben, but at the present time the same fuel is used in gas producers for heating a range of ten 30-ton Siemens furnaces working the basic process on magnesite bottoms, in which the bulk of the produce is converted into steel. Full details of the construction of these furnaces will be found in Professor Pavloff's atlas of the open-hearth furnace, published in 1904.[8] The puddling furnace, however, still survives in the district, a principal use being in the production of steel for crucible steel melting stock. The production of steel blooms in the open charcoal fire (Rohstahlfeuer) is still carried on in some small mountain forges, but on an extremely restricted scale, for extremely special steel-making purposes.

[7] A model showing the present state of the workings has been prepared for the Imperial Mining Academy at Leoben.

[8] Much interesting information on the Styrian works will be found in Braune's report in Vogel's *Jahrbuch* for 1900, pp. 206, 274.

Cobalt can be separated from manganese by means of potassium nitrite in the same manner as from nickel, provided a nitrate or a chloride solution is used. A sulphate solution gives unsatisfactory results.

THE EMMA MINE.

By Frederic Keffer, Greenwood, B.C.

(Toronto Meeting, 1907.)

Among the low grade mines of the Boundary District the Emma is in a way unique, in that the magnetite, which constitutes the main portion of the ore body, has persisted from the grass roots to at least the 250 level in a practically continuous vein or deposit; and also in that the vein stands vertically so far as explored.

In the other low grade mines of the district magnetite is a frequent constituent of the ores, but its occurrence is most erratic, the deposits being irregular, varying in size from a few ounces to masses of thousands of tons, and frequently dipping (so far as any dip is observable) entirely at variance with the general dip of the ores with which they are associated.

A characteristic case was that of a body of magnetite of exceptionally good value found on the 300 foot level of the Mother Lode mine, which lay perfectly flat, being about 20 by 100 feet in area, but only 7 to 8 feet thick, and which was encased in barren eruptive rocks.

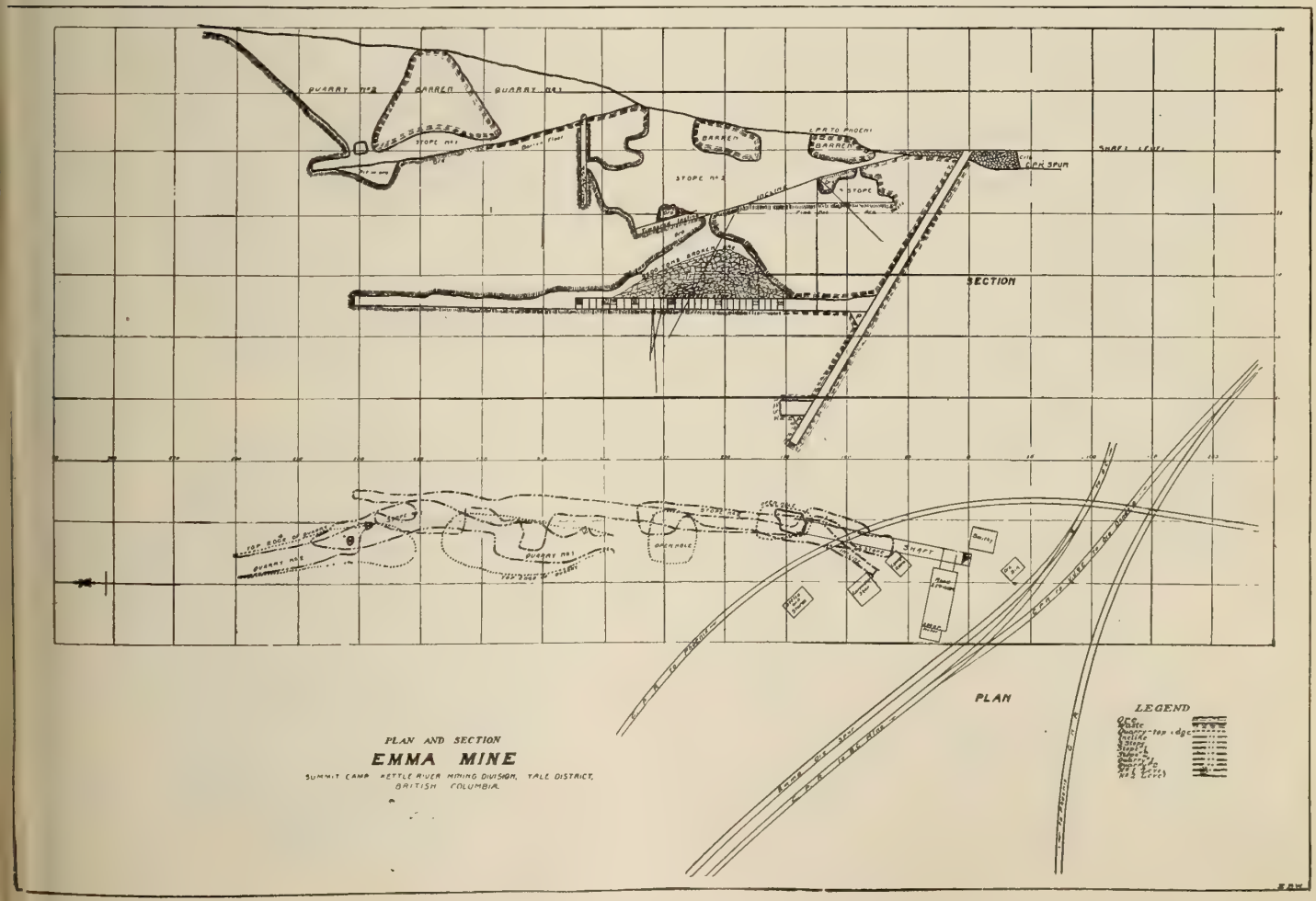
In the Emma (save in Quarry No. 1, where a slip has thrown the ore about 25 feet to the southeast) the magnetite continues unbroken to a point some 200 feet below the surface, where diamond drilling has found what is seemingly another slip, throwing the ore again a short distance to the southeast. Diamond drilling on the 250 foot level has recently located the ore near the shaft.

The Emma ores are found along the contact of eruptive extensive "island" surrounded by eruptive flows. These latter rocks are of the general types characteristic of the Boundary district, analysis of which usualy lie between the limits of:—

	Per cent.
Silica	30 to 40
Iron	15 to 25
Lime	10 to 20
Magnesia	0 to 5
Alumina	5 to 15
Alkalies	0.5 to 2

To the east of this "island" of limestone are several pyrrhotite deposits, the most prominent of which is that occuring on the "Mountain Rose" mineral claim. This pyrrhotite is extensively mined for use as sulphur flux, it being sometimes essential in order to reduce the grade of copper matte, thereby avoiding unnecessary slag losses, which accompany matte running over 50 per cent. copper. This sulphur ore consists of pyrrhotite, together with varying proportions of lime, alumina and silica, but with little or often no magnetite, in striking contrast with the Emma ores, which contain little or no pyrrhotite.

On the Emma, to the south of the limestone "island," occurs a body of magnetite, which where mined was some 20 to 100 feet in area. This ore was followed to a depth of about 25 feet, where it was cut off by a slip, beyond



which no further work has been done. But little pyrrhotite was found in this place.

To the west of the limestone island occurs the main ore body of the Emma mine, which ore has been developed by quarries and drifts for some 575 feet, shown in plan and section on the accompanying map.

Most of the ore next the east wall of the deposit(which here runs about 5 degrees east of north) is magnetite, but minor bands of garnetite also occur. Along the northwest wall, however, the magnetite for the most part is next a garnet zone, which (where crosscut by diamond drilling on the 150 foot level) passes into a bluish and very silicious rock beyond which the drill was not pushed.

In other places the magnetite stands directly against snowy white crystalline limestone, which latter rock, when near the ore, frequently carries masses of magnetite and chalcopyrite embedded within it, this mineralization extending sometimes several feet into the limestone in diminishing ratio. In other cases, however, the line between this limestone and the ores is clear cut. The garnet zone is about 20 to 25 feet thick and in places carries sufficient copper to pay for mining.

More or less epidote also occurs along both walls of the ore. The magnetite frequently includes masses of crystalline lime spar, which are almost always accompanied by enrichments of copper. The garnet zone includes considerable magnetite scattered through the rock in crystals and little patches.

On the surface to the north of the workings the magnetite gives place to garnet ore well mineralized with copper pyrites. Still further north (about 1,000 feet) the garnet again crops for several hundred feet carrying good values in copper, but now dipping to the west about 70 degrees. The copper and gold contents of the ore show decided increase on the 150 foot level as compared with the ore miner in the quarries. Following are analyses and assays on two lots of several thousand tons each:—

Quarry.—Gold, 0.07 oz.; silver, .06 oz.; copper, .52 per cent.; silica, 16.5 per cent.; iron, 43.6 per cent.; lime, 12.1 per cent.; sulphur, 1.1 per cent.

150 Foot Level.—Gold, .031 oz.; silver, .06 oz.; copper, 1.28 per cent.; silica, 14.9 per cent.; iron, 40.7 per cent.; lime, 14.4 per cent.; sulphur, 1.7 per cent.

The average thickness of the magnetite deposit in the upper workings is some 18 feet, but on the 150 foot level the ore widens materially, being in places 40 feet across exclusive of the garnet ore zone. A fair average thickness of the workable ores of the mine would be 25 feet. Below are given analyses of the garnet zone, the silicious bluish drill cores beyond the garnet, the general country and also the white crystalline limestones, the rock lying immediately east of the magnetite and an approximate average of the general eruptive rock of the district. Alkalies, magnesia and other constituents present in small quantities are not included:—

	Silica	Iron	Lime	Alumina	Sulphur
Garnet zone	26.8	23.5	32.6	12.0	1.5
Bluish drill core beyond garnet	63.6	5.3	4.5	16.9	.52
Limestone country rocks	18.3	2.3	43.9	5.6	.00
White crystal limestone	7.6	.8	56.0	.3	.12
Rock next the magnetite on the east	38.5	6.5	27.6	19.3	.47
Eruptives	35.0	20.0	18.0	15.0	

It is evident from these analyses that the limestone and eruptives contain in sufficient measure all the constituents necessary for the formation of the garnet and magnetite zones. That these latter rocks were produced by the hot water gases and water carrying dissolved mineral derived from the eruptives, reaching upon the adjacent limestones through replacement and recombination, can hardly be doubted.

It is seen from the analyses of the ore that the sulphur present is very small, barely more than sufficient to form the copper pyrites present.

Iron sulphides are of rare occurrence, and it seems certain that the magnetite was deposited as such, and did not result from the alteration of sulphides. This view is vorne out by the fact that as a rule magnetite crystals and not iron sulphides are found in the garnet zone, however far removed from the main body of magnetite. The crystalline limestone found next the magnetite in the mine is considerably purer than the main portion of the limestone formation.

The accompanying photographs of rock sections from the Emma throw an interesting light on the formation of the deposit. Fig. 1 is a speciment of garnet ore, and

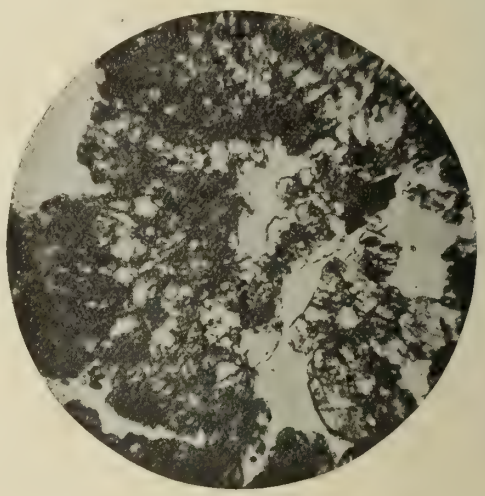


Fig. 1.

shows a limestone in the course of alteration to a garnet rock. Some calcite remains, but it has mainly been replaced by garnet, together with a little quartz. Copper pyrites run through the mass in irregular strings and bunches, and there are also some bits of magnetite.

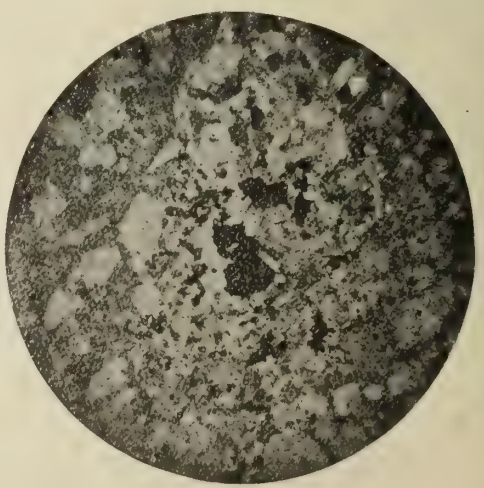


Fig. 2.

Fig. 2 represents a rock from the 150 foot level, in which all the original mineral has been replaced by plagioclase, feldspar and actinolite, together with some copper sulphides. This rock is probably an altered eruptive rather than a limestone replacement.

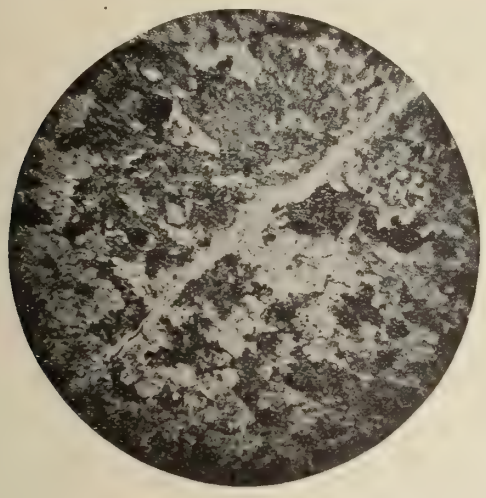


Fig. 3.

Fig. 3 is a section of the rock which cuts off the Emma deposit on the south. It is chistose through great pressure, and is mainly composed of feldspar and hornblende. A few crystals of iron sulphide are also present.

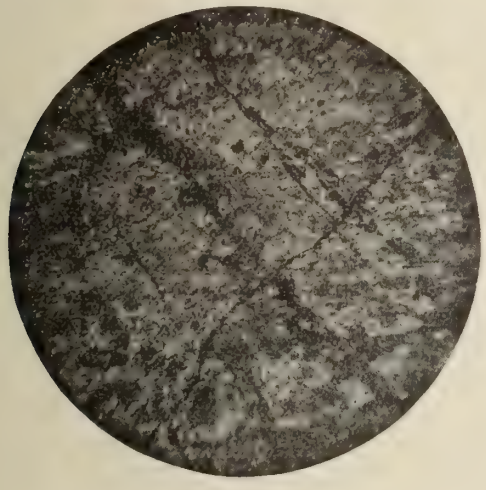


Fig. 4.

Fig. 4 is from near the ore on the 250 foot level, 40 feet north of the Emma shaft, and, like Fig. 1, shows limestone in the course of conversion to garnet.

Some pyroxene is present in small grains, and all the calcite which remains is in minute lines running through the rock.

The sections are magnified 25 diameters.

Mining.—Owing to the vertical position of the deposit, mining here is a much simpler problem than in most of the Boundary mines. The shaft is a two compartment incline, angle 60 degrees. Across the drifts are placed heavy stulls supported by posts, the stulls and posts in the widest portions of the drift being often 30 inches in diameter.

The stulls are placed 5 feet apart, and are covered with 8 to 12 inch pole lagging. Chutes are provided at convenient intervals, they being at the opening 3 1-2 to 4 feet wide by 2 to 2 1-2 feet deep, so as to allow large rocks to pass. The ore is broken down on the timbers to the level above, only the swell being drawn from the chutes, which swell amounts to about 40 per cent. After the level above is reached the stopes can be drawn at will, and, commencing at the point furthest from the shaft, the timbers can be removed if in condition to be used elsewhere. In commencing a stope it is of course necessary to first raise to the level above to secure ventilation. In portions of the work where bodies of crystalline limestone or poor garnet ore are found these are left as pillars to reduce the cost of timbering. The ore is so heavy, averaging from 8 to8 1-2 cubic feet to the ton when in place, that timbering must be of the heaviest description to bear the weight above, which weight, owing to the vertical walls, rests almost entirely on the timbers. Power is supplied from the Bonnington Falls electric plant, some 85 miles distant, the machinery at the mine consisting of a 12 drill cross-compound Rand compressor, driven by a 200 h.p. motor, together with a hoist, now driven by compressed air, but which will shortly be replaced by an electric hoist. There is also a steam driven X Ingersoll straight line class A compressor, capacity about 8 drills, which machine is held as a reserve.

There have been shipped from this mine to date some 93,500 tons of ore.

NOTE.—Rock sections were furnished through the courtesy of Dr. Frank D. Adams of McGill University, who also made a petrographic examination of them.

BOOK REVIEWS

TABLES OF MINERALS — INCLUDING THE USES OF MINERALS AND STATISTICS OF THE DOMESTIC PRODUCTION, BY SAMUEL LEWIS PENFIELD, M.A., LLD. 8VO., VI X. 88 PAGES. CLOTH, $1.00. NEW YORK, JOHN WILEY & SONS, 1907.

Part I. of this new book consists of a list of minerals arranged according to the six systems of crystallization. Part II. gives an arrangement of the minerals according to the elements, with their uses. Statistics of production are also included. In Part III. a number of useful minerals are described, such as corundum, mica and talc. Part IV. gives lists of minerals according to geological occurrence and association. The general classification is Igneous, Sedimentary, Metamorphic and Accessory Minerals. Veins and vein minerals and minerals resulting from contact metamorphism are touched upon.

For the mining engineer whose geological knowledge is in need of repairs this little book will prove most useful. The several methods of classification are suggestive. While by no means a text-book, the volume will be found a convenient and ready source of reference.

The *Mining World,* October 5th, presents an article on "The Sudbury Nickel-Copper Field, Ontario," by Ralph Stokes. Mr. Stokes recommends the encouragement of a new nickel producing plant in the Sudbury region. Competition, he thinks, would lower the price of nickel and lead to a great expansion of trade. In this we cannot agree with Mr. Stokes. A knowledge of Sudbury's rise and development and familiarity with the present conditions of the nickel market and industry will lead to a modification of this view.

GYPSUM AND GYPSUM PRODUCTS IN 1906.

(Condensed from a Bulletin of the United States Geological Survey.)

Pure gypsum is a hydrous lime sulphate having a chemical formula $CaSO_4\ 2H_2O$. Reduced to percentages of the weight it may be represented as follows:—

Gypsum ($CaSO_4\ 2H_2O$) { Lime Sulphur ($CaSO_4$) { Lime (CaO) ..... 32.6; Sulphur Troxide (SO_3) 46.5 } 79.1; Water H_2O ..... 20.9 }

Few deposits of rock gypsum are ever approximately as pure as this. Clay, limestone, magnesian limestone, iron oxide and silica are usual impurities.

Where gypsum occurs in an earthy, granular condition, it is known as gypsite and may carry 10 to 20 per cent. of impurities.

Dehydration to this extent can be accomplished at any temperature between 212 degrees F. and 400 degrees F. It is found most economical of fuel and time to carry the process at the highest allowable temperature.

A general plan of calcining plaster—the size and weight of machinery depending upon the capacity desired—is as follows:

The gypsum rock is crushed first in a jaw crusher; second, in a pot crusher; and then it goes to a rotary kiln drier. This drier is erected in brickwork like a boiler, and is equipped with an automatic feeder. If soft coal or wood is used as fuel, care must be taken that the products of combustion do not come in contact with the materials being dried, on account of the danger of discoloration. Fuel of any kind—oil, gas, coke, wood, or coal—is suitable. This drying process, eliminates 10 per cent. of the moisture. Next, the crushed rock is

Analyses of Gypsum and Gypsite.

	Silica (SiO_2)	Alumina (Al_2O_3) and iron oxide (Fe_2O_3)	Lime carbonate ($CaCO_3$)	Magnesium carbonate ($Mg\ CO_3$)	Lime sulphate ($CaSO_4$)	Water (H_2O)
1. Gypsum from Blue Rapids, Kan..	0.40	0.19	0.35	0.35	78.10	20.36
2. Gypsum from Alabastu, Mich....	0.05	0.08	....	0.11	78.51	20.96
3. Gypsum from Hillsboro', N.B....	0.10	0.10	....	....	78.55	20.94
4. Gypsum from Baddeck Bay, N.B.	0.11	1.07	....	....	78.42	20.43
5. Gypsum from Salina, Kan.....	9.73	0.78	4.32	Trace	68.29	16.88

Distribution of Gypsum.—Gypsum occurs in sedimentary rocks of practically all ages, either in the crystalline form or as rock gypsum, and it is widely distributed over the world. It is commonly found near beds of rock salt. In the United States workable deposits are confined to beds of rock gypsum, which occur east of Missouri River in Paleozioc rocks, while those of the West are mostly of Mesozoic and Tertiary age. Gypsum is produced in seventeen States and Territories, besides Alaska. Mills for grinding and burning it are operated at nearly all the places of production.

Uses.—Most of the gypsum produced is manufactured into the various plasters, such as plaster of Paris, stucco, cement plaster, flooring plaster, hard-finish plaster, etc. A steadily increasing quantity is being used as a retarder in Portland cement. Refined grades of plaster are used in dental work, also as cement for plate glass during grinding. Considerable quantities are ground without burning and are then used as a low grade fertilizer, while smaller quantities are used in the manufacture of paint and paper, imitation meerschaum and ivory, and as an adulterant. The pure white massive form, known as alabaster, is much used by sculptors for interior ornamentation. The reputed excellence of British beers is attributed to the presence of calcium sulphate in the natural water used in their preparation.

Chemistry and Practice of Gypsum Burning.—In addition to the combined water, the rock may contain as much as 25 per cent. of absorbed moisture. If pure gypsum is heated to a temperature of more than 212 degrees F. and less than 400 degrees F., all the moisture and a certain definite portion of the combined water will be driven off, and the gypsum thus partially dehydrated will be plaster of Paris. The composition of plaster of Paris may be represented thus:

$CaSO_4\ \frac{1}{2}H_2O$ { Lime Sulphate ($CaSO_4$) ..... 93.8; Water (H_2O) ..... 6.2 }

sieved in a trommel, generally to 24 mesh. The material that does not pass the sieve is ground in buhr mills, and this product, with the screenings from the trommel, is ready for boiling. The boiling is done in a large kettle with wrought steel sides and cast iron or very heavy steel convex bottom. Flues pass through the kettle near the bottom and distribute the heat, which is applied below the kettle and passes around the lower part of the sides, through the flues, and then around the upper part of the sides and out at the stack. Inside the kettle is a shaft, which propels stirrers below the flues and mixing paddles above. The kettles are heavy and rest on brickwork. The ground gypsum is fed from bins into the kettle, and is constantly stirred and boiled until the remainder of the free moisture is expelled. The temperature of this preliminary boiling should not exceed 265 degrees F., for at a higher temperature the water of crystallzation, or combined water, begins to separate, and then the separation must be completed or the calcination will be a failure. To remove the necessary three-fourths of the combined water the material is then heated steadily to a temperature of 390 degrees to 395 degrees F. Care must be taken not to allow the temperature of this second boiling to exceed 400 degrees, or all the combined water will be expelled and the plaster will lose its setting properties. When properly boiled the gypsum settles and may then be discharged through a gate on the side near the bottom of the kettle. After boiling, the plaster should be screened again through 40 mesh wire cloth, and the oversize should be reduced in a finishing buhr mill.

To manufacture 100 tons of plaster a day the following machinery is required:

1. A crusher; estimated cost, $1,000. 2. One direct heat drier, 48 inches in diameter and 27 feet long, together with one dust room; estimated cost, $2,500. 3. One pot or bowl crusher for fine grinding the material

after drying; estimated cost, $300. 4. Four French buhrstones for grinding; cost, about $300 each. 5. Two calcining kettles, $200 each. In addition to the above mentioned machinery the necessary elevators, conveyors, shafting, belting, and bins are required. On account of the nature of the process and material, the bins, elevators and conveyors should be made of steel, and the entire plant should be as nearly fireproof as practicable.

Trade Conditions.—Active demand for gypsum products continued throughout the year 1906. New deposits were discovered in Riverside County, California, and other localities. Alaska became a producer of gypsum. Increasing trade is very generally noted. At Mabou, Nova Scotia, a new mine has been opened, the output of which will be shipped by water to New York points.

Production and Disposition.—The gypsum mined in the United States in 1906 amounted to 1,540,585 short tons, valued at $1,147,129. This production represents an increase in quantity of more than 47 per cent., and in value of nearly 40 per cent., as compared with that of 1905. The total number of producers at the close of 1906 amounted to 74, as against 46 in 1905. The State of Michigan holds first place, New York second, with Iowa a close third. The average price per ton for crude gypsum was 74 cents. The maximum reported was $1.47 in California, Nevada and Oregon. The minimum, reported from Wyoming, was 24 cents.

One hundred and eighty-six thousand nine hundred and ninety-nine tons of the gypsum produced was sold crude; 62,671 tons sold as land plaster; 899,581 tons sold as calcined plaster.

Imports.—Gypsum imported into the United States comes almost wholly from Nova Scotia and New Brunswick, with the exception of a few hundred tons annually from France and the United Kingdom. It enters the ports of the New England and Northern Atlantic States, over one-half entering the port of New York. The gypsum imported is nearly all calcined and converted into wall plaster. For the year 1906, a total quantity of 3,587 tons, valued at $22,821, of ground or calcined plaster was imported; and 436,999 tons of unground, valued at $464,725.

Canada.—Gypsum occurs in New Brunswick, near Hillsboro', Albert County, and near St. John Harbor; in Nova Scotia, in many localities, such as Windsor, South Maitland and the intervening district, and at Baddeck, Cape Breton. In Grant and Haldimand Counties in Ontario, and on Manitoba Lake, Manitoba, there are also large deposits. The deposits of the Maritime Provinces are of most interest to the American producers. Most of this Canadian gypsum is calcined in plants near seaboard cities; but a considerable quantity is shipped as far inland as Syracuse, N.Y.

COAL BRIQUETTING IN THE UNITED STATES

Paper read at Toronto Meeting of A.I.M.E.

(Continued from last issue.)

California.

The manufacture of briquettes has shown more actual progress in California than any any other State of the Union. This has been brought about through the efforts to improve the fuel quality of the rather low grade character of the California lignites, and has been encouraged by the high prices of the better grades of bituminous coal or anthracite brought into the State from Washington, the Rocky Mountains, and Eastern States, or imported from British Columbia, England, Australia, and Japan. It has also been encouraged by the cheap asphaltic pitch obtained from California petroleum, which not only serves excellently as a binder but adds to the calorific value of the briquetted fuel.

The first plant to be put into successful operation in California was one built at Stockton by the San Francisco & San Joaquin Coal Company. The plant was completed in 1901, and when running at full capacity could produce 125 tons of briquettes per day. The fuel used was lignite from the Tesla mines, in Alameda County. The plant was, unfortunately, entirely destroyed by fire in 1905 and has not been rebuilt. It is stated that the plans of the company were to rebuild the plant at San Francisco, but these were upset by the earthquake and fire which destroyed a large part of that city in April, 1906. A complete description of the Stockton plant by the designer of the presses, Mr. Robert Schorr, of San Francisco, has been published.[7] The briquettes produced at this plant were round, convex lenses or "boulets," which weighed from 6 to 8 ounces.

The Western Fuel Company, of Oakland, completed early in 1905 a briquetting plant, also designed by Mr. Schorr.[8] In mechanical construction this plant differs materially from the one destroyed by fire at Stockton. The shape of the briquettes is cubical instead of "boulet." The advantage claimed for the cubical shape is that the briquettes ignite more readily, though it is admitted that in handling the same mechanically there is more waste.

The capacity of this plant is 480 briquettes per minute, or 8.5 tons per hour. The fuel used is coal yard screenings from lignites, anthracite, and sub-bituminous coals, with about 7.5 per cent. of asphaltic pitch. This pitch is obtained by the distillation of California crude petroleum. The temperature of the still, for the production of the proper grade of pitch, is about 600 degrees F. Some difficulty has been experienced in securing the right quality of pitch on account of the tendency of the refineries to "rush the stills," their aim being the securing of refined oils rather than pitch. An excellent grade of asphaltic pitch is obtained by keeping the stills at a temperature of 500 degrees F., using a vacuum to force the distillation. Grade "D," the quality best adapted for the purpose, is fairly hard up to 60 degrees F., but begins to soften above that point. It becomes liquid at 250 degrees F., and has a specific gravity of from 1.05 to 1.1.

Before the earthquake, the Western Fuel Company paid $10.50 per ton for the ordinary pitch "D" delivered at its plant, while a properly and carefully prepared pitch was worth from $12 to $13.

[7] *The Engineering and Mining Journal,* vol. lxxviii, p. 262 (1904).

[8] *The Engineering and Mining Journal,* vol. lxxx., p. 389 (1905).

Owing to the enormous building activity in San Francisco since the earthquake, the demand for asphaltum for roofing materials has increased in leaps and bounds. Consequently, there is a great scarcity, and the price per ton now ranges from $14 to $20. This scarcity necessitated many shut-downs of the plant at Oakland, and for that reason the company is negotiating for the importation of coal tar pitch from the East and from Europe. As three new refineries are contemplated, conditions may gradually return to their normal stage.

All of the coal purchased and mined by the Western Fuel Company is brought in ships and is unloaded by electric hoists into receiving bins. When drawn from the storage bins it is screened, all material passing through the perforations dropping into auxiliary bins from which it is fed into a Williams crusher. The disintegrated coal from the Williams crusher is elevated into the iron hopper of an automatic feeder which feeds into the coal heater. The heated coal enters the mixer and meets there the binder. The mixer as well as the binder distribution and the tempering of the mixture embody some novel features.

The prepared material is conveyed into the feed hopper of a Schorr press, style "A," which is belted for 6 revolutions per minute. At that speed 480 briquettes of 9.5 ounce weight are discharged in one minute, or more than 17,000 pounds per hour. The briquettes are of a rectangular shape, 2.75 by 2.5 by 1 7-8 inches thick, with rounded corners and branded with a "W." They are uniform in size, and have a specific gravity of about 1.22.

All wearing parts of the press are lined with phosphorus bronze, and they are thoroughly lubricated under an air pressure of 40 pounds per square inch. Oil is also atomized and sprayed into the moulds and upon the plungers.

The briquettes drop upon a short conveyor delivering the same to another one located outside the building. At this point provision is made to sack the briquettes for the local market, or to take them up to the top of the storage bunkers, where arrangements are made to discharge the briquettes into cars or to distribute them into the bunker compartments. The average output is 64 long tons per shift of 8 hours, four men being employed, one of them getting $4, one $2, one $3, and one $2.75 per day, which makes about $0.20 per ton of briquettes. By running 24 hours more than 200 tons could be made, which would reduce the labor item to about 14.5 cents per ton. This can be further cut down by speeding up the press to 7 revolutions per minute, which would produce 560 per minute, or 20,000 pounds of 9.5 ounce briquettes per hour. With a forced feed attachment a further increase in speed may be possible.

Since the foregoing was written, wages have been increased considerably, most of the men getting $3.50 per shift, working through the lunch hour.

The present pressure arrangement was tested up to 48,000 pounds, exerted upon two 2.5 by 2.75 inch surfaces, making more than 3,700 (?) pounds per square inch. The adjustment is placed to give about 2,900 pounds, which is ample, and makes a better-burning briquette than when a greater pressure is used. The press is designed for a maximum pressure of 6,000 pounds.

The briquetting press has been described by Mr. Schorr substantially as follows:[9]

"In this press two sole plates with heavy bearings are arranged to carry a stationary steel shaft, upon which a large spur wheel is revolving, driven by means of gearing, countershaft and friction clutch pully. The spur wheel rim is made integral with a mould ring which has a series of holes and sliding plungers (pistons) therein. The pistons are under continuous control of cams which are supported by heavy shields. The pistons are released from the camway only when the final pressure is applied, and this is done by a large wheel with steel tire, pivoted in two levers.

"This wheel is pressed against the piston heads by means of an adjustable spring, which permits a perfect regulation of pressure up to 4,000 pounds per square inch. After leaving the pressure wheel, *i.e.*, after the briquette is made, the plungers are gradually forced forward to eject the briquettes, which drop upon a vibrating discharge chute.

"The pistons are then gradually withdrawn, and in passing the feed box the cavities become filled with the mixture of coal and pitch. At the end of this feed box all surplus material is scraped off by a steel plate. After passing the scraper plate the pistons are gradually forced in, pressing the material against the resistance block, which is supported by the main shaft. This pressure is effected by a cast iron stand with phosphor-bronze liner.

"When the pistons are about 0.5 inches from their terminal, they strike against the rocking pressing wheel and are forced home. In this way the briquettes are made, and the play repeats itself with every revolution.

"The machine is entirely self-contained, and it is claimed that there is no possibility of its getting wrecked by overfeed or obstruction. It is also claimed that as the pressure is applied slowly and gradually, this type of press permits briquetting mixtures containing from 13 to 14 per cent. of moisture, and that it is an advantage not possessed by intermittently-acting presses. Up to the present time two press designs have been made, the one with two rows of 2 inch cylindrical moulds, and the other with two rows of 2.5 by 2.75 inch rectangular shapes with rounded corners. There is no difficulty in making other shapes and heavier briquettes. A simple arrangement permits working with half the capacity whenever desired. No complications are presented if it is desired to have more than two rows of moulds, and the type of press can be built for a much larger capacity. On the other hand, should the market for briquettes be limited for some months in the year, the capacity can be cut down without requiring any change in speed or other alterations.

"From 80 to 120 briquettes are made for each revolution, the number depending on the size and shape of the briquettes, which govern also the capacity. The same varies from 6 to 24.5 tons per hour. The briquettes are uniform in size and plainly branded with 'W.'"

Mr. Schorr says that all wearing parts of the machine can be quickly and cheaply replaced. The lubricating is done by an air compressor and oil atomizer.

The press is especially adapted for the manufacture of small briquettes, and the use of such in preference to large blocks is obvious. Small briquettes can be readily shoveled into furnaces, while the large ones have first to be broken up, thus causing labor, waste, and dust.

A briquetting plant of an entirely different type, designed by Mr. Chas. R. Allen, was built and put in operation by him during 1905 at Pittsburg, at the junction of the San Joaquin and the Sacramento Rivers, about 50 miles from San Francisco. This plant, as originally projected, was intended to utilize the lignite produced by

[9] *Engineering and Mining Journal*, vol. lxxx., p. 627 (1905).

the Pittsburg Coal Mining Company at Somersville, but the enormous increase in the production of oil in California has had such a demoralizing effect upon the coal trade generally that there has been little or no market for lignite during the last two years, and these mines have been shut down. The material used has, therefore, been screenings obtained from the coal yards of San Francisco, the binder (here as at other plants in the State) being asphaltic lignite, and as long as the supply of this material is available at such prices it will continue to be used.

The methods of preparing the briquetting mixture differ somewhat from those used at other plants in that the binder is passed, together with the fuel, through the retorts under a high degree of heat. This, it is claimed, insures an intimate and thorough mixture, each particle of fuel being impregnated with the binder. This treatment, it is asserted, prevents the binder from being consumed before the coal is ignited, which is apt to be the case, particularly with lignites, if the mixing is merely superficial.

Mr. Allen claims that in his process the nature of the fuel is changed so that the lignite partakes of the character of bituminous coal, the briquettes remaining firm and hard until entirely consumed. He claims also that the process possesses as much of novelty and value as the press.

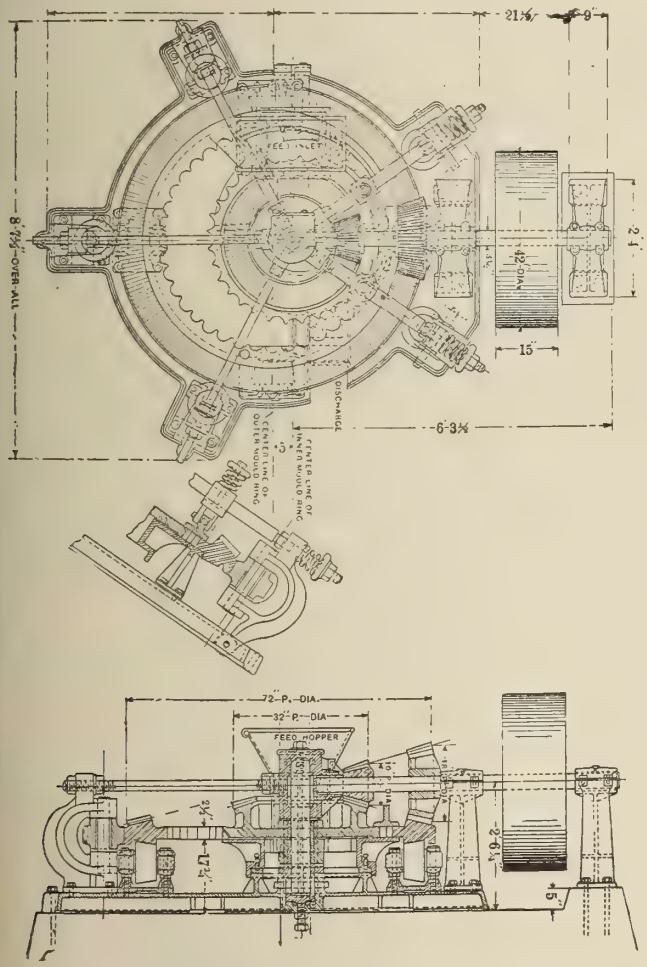


Fig. 11.—Allen Briquetting-Machine. (Plan and Elevtion.)

As shown in Figs. 11 and 12, the compressing machine consists of two non-concentric rings horizontally placed, one within the other, the periphery of the smaller one being corrugated, or scalloped, and engaging with similar corrugations in the inside of the larger ring. The briquetting mixture is fed into a hopper one-fourth of a revolution of the smaller ring from the point of compression, and the amount of pressure is regulated by the distance of the feed from the point of compression; that is to say, the hopper may be placed further away if a

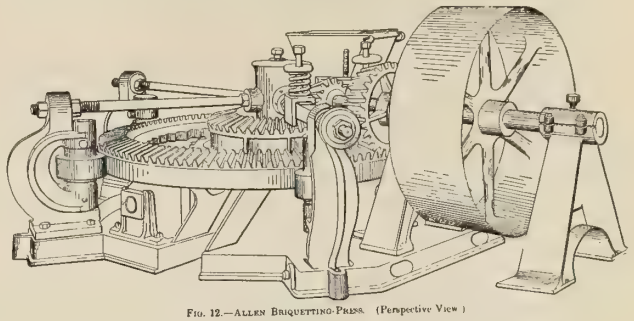


Fig. 12.—Allen Briquetting-Press. (Perspective View.)

Fig. 12.—Allen Briquetting-Press. (Perspective View.)

greater pressure is desired, or nearer, if the pressure is to be reduced. Relief from an excess of pressure is provided for by two heavy spiral springs on the outer bearings, and two over the upper pressure plate, the lower pressure plate being fixed. The relief springs are shown in Fig. 11. The machine has been operated without using any of the springs, with the result that when there was a surplus of feed the operating belt was thrown off through the choking of the machine.

Mr. Allen's invention is patented.[10] The briquettes, as now made, are approximately cylindrical in shape, with flat ends. They weigh from 8 to 10 ounces each, and have a specific gravity of 1.14. It is Mr. Allen's intention to reduce the size of the briquette and change its shape by having the smaller ring of the press made without corrugations. This will be done in order to meet the demand for a briquette adapted for domestic use.

The plant is at present turning out about 5 tons of briquettes per hour, at a moderate running speed. With a smaller briquette the production per hour would be decreased, with the same speed, while with an increased speed the same production could be maintained, even with the smaller briquette.

The Standard Coal Briquetting Company, of Oakland, constructed in 1905 a plant designed by a Mr. Crawford. An accident to the press shortly after being put in operation practically wrecked it, and the enterprise was unsuccessful.

Another plant beginning operations in 1905 was a small plunger type of press designed by Mr. A. Demetrak, and built by the American Briquetting Company (afterwards reorganized as the Ajax Briquetting Company), of San Francisco. It was destroyed by the earthquake and fire of April, 1906, and has not been rebuilt. The plant had a capacity of about 15 tons a day, using Coos Bay, Ore., lignite, sometimes mixed with coal yard screenings, and asphaltic pitch.

The United States Briquette Company, of Stege, Contra Costa County, has undertaken the manufacture of briquettes from a mixture of peat and California crude petroleum. This plant had not been completed at the time of writing this report, but some briquettes made of the mixture in an experimental way are interesting productions. They give promise of a method of using California oil as a domestic fuel, the peat, on account of its spongy character, acting as a carrying vehicle for the oil, and at the same time performing duty as fuel. The briquettes are cubical in shape and of attractive appear-

[10]U. S. Patent No. 851,007, April 23, 1907.

ance. They weigh about 10 ounces each and have a specific gravity of 1.3.

It is claimed that they are as well adapted for steam-raising as for domestic purposes, giving an intense heat under forced draft, and burning freely under ordinary draft; that they can be handled without waste from breakage, and that they leave a minimum of ash and do not clinker.

Arizona.

The Arizona Copper Company, of Clifton, installed, during 1905, a briquetting plant purchased from Messrs. Yeadon, Son & Company, of Leeds, England. The plant was put in operation in September, 1905, and, during the first six months of 1906, produced 690 short tons of briquettes of a total value of $4,830, or an average of $7 per ton. About 300 tons were produced in the experimental runs made in 1905. It was installed for the threefold purpose of utilizing coke breeze, which is without value and non-usable as such; for securing better efficiency out of the slack coal (Gallup) which is used as fuel; and for obtaining a fuel that could be stored without material deterioration, and without danger of spontaneous ignition. Mr. James Colquhoun, president of the company, affirms that what economic advantages are secured are from the first and third operations. In the briquetting of the coke fines or breeze a profit of about $4 per ton is made in the conversion of a formerly-wasted material into a usable fuel. In using the Gallup, N. M., slack, which is of sub-bituminous, or black lignite, quality of coal, the expense of briquetting brings the total cost up to approximately $6.80 per ton, or about the same as that of the lump coal obtained from the same source, although the price for the slack at the mines is very low when compared with that of lump coal. The briquettes have been found to burn freely and satisfactorily under locomotive and stationary boilers, and appear to be equal to the best of Gallup lump coal, but no laboratory tests of calorific power have been made.

The real profit in the briquetting of this coal is in the superiority of the briquettes over lump coal for stocking purposes. They stand weathering perfectly, while the lump coal disintegrates upon exposure, loses a portion of its combustible gases, and becomes in time a very inferior fuel. It is also liable to spontaneous combustion, which the briquettes are not.

In the making of the briquettes 92 per cent. of the coal is mixed with 8 per cent. of California asphaltic pitch. The capacity of the plant is 2.5 tons of briquettes per hour.

The following description of the process at Clifton has been furnished by the company. In design the press is similar to the one used by the United States Geological Survey coal testing plant at St. Louis. This was designated as the "English" machine, and has been described in the reports of those tests.[11]

The process of making briquettes of coal or coke fines is that of Yeadon, Son & Company, of Leeds, England. The fines are fed from the bins into the boot of a bucket elevator, which discharges them into the hopper at one end of a mixer, where they are mixed with pitch that has previously been broken in a pitch breaker into pieces of 0.5 in. maximum size. The quantity of pitch found to give the best results is about 8 per cent.

From the mixer the material is sent into a disintegrator, which thoroughly pulverizes the coal and pitch into grains of 2-mm. size and under. It is then elevated and passed into a heater, where it is subjected to the action of live steam, which gives the pitch sufficient fluidity to bind the other ingredients.

From the heater the material drops into a pug mill, which, while stirring the mass, sweeps it into a false bottom. This false bottom is behind the disc of the briquetting machine, and, at each revolution of the main shaft, the material is rammed into a pair of compartments in the disc. The disc contains eight pairs of such compartments, and at the same time that a pair of briquettes is being rammed into the disk on one side, another pair is being compressed on the opposite side, while a third pair is being pushed out from the top of the disc into an endless belt conveyor, which delivers the briquettes to the side of a railroad car in front of the building. The briquette disc is made to revolve intermittently in eight periods to each complete revolution. During the pause in each period, the three operations referred to take place simultaneously.

The capacity of the plant is 25 tons per 10 hours. It is arranged to mix three ingredients into material for briquettes, but at present only the fines from coal or coke and pitch are used. The briquettes are rectangular in shape and weigh approximately 4 pounds each.

Michigan.

The Semet-Solvay Company, of Syracuse, N.Y., has recently completed the construction of a briquetting plant at Del Ray, to be operated in connection with the by-product coking ovens and chemical works installed there several years ago by the same company. The installation of the briquetting plant was begun about two and a half years ago. As originally constructed, the briquetting machine was a reciprocating press of English make, but after carefully working out the process the company came to the conclusion that a press of the reciprocating type is adapted only to large briquettes, whereas the markets for which this product was intended demanded a small briquette for the domestic trade.

As the result of the experience gained with the English machine, the company has developed a process for the manufacture of small briquettes, and although this plant is just beginning to run it gives excellent promise.

The process consists essentially of the intimate mixing of finely powdered pitch of proper quality and consistency with pulverized coal, so that theoretically each particle of coal is coated with the fine pitch. The mixture is then brough up to the proper temperature with steam, or steam and hot water, and is fed to a rotary Mashek press built by the Traylor Engineering Company, of New York. The output of the plant is from 10 to 15 tons of briquettes per hour. These are from 2.5 to 3 ounces in weight, and about 1 7-8 inches square, shaped somewhat like a miniature sofa pillow. This shape is satisfactory for shoveling and for handling in household stoves and furnaces. The company is using a portion of coke breeze with the coal and pitch, with a view to making use of the breeze from its coke plant, and it is also experimenting on the best mixtures and the best grades of coal. The briquettes made so far are said to burn well and to give no smoke, except a slight puff when they are first thrown on the fire. As the plant is not yet in full running, some minor adjustments are still being made to perfect the product, but the operators are much encouraged by results so far obtained, and expect within a short time to be making a thoroughly satisfactory and commercial product.

Missouri.

Renfrow Briquette Machine Company. - During the summer of 1903, Governor W. C. Renfrow, of Oklahoma,

[11] *United States Geological Survey Bulletin* No. 261, and *Professional Paper* No. 48.

became financially interested in a briquetting company in St. Louis. In the fall of the same year Mr. E. D. Mizner, of Hamilton, Ont., visited St. Louis to make a report for some Canadian interests relative to the purchase of the Canadian rights for the patents of this company. The results of these investigations, and the efforts of Govrenor Renfrow to force the briquette company to deliver a machine, ended in the bankruptcy of the company. In October, 1903, an agreement between Governor Renfrow and Mr. Mizner was made by which Mr. Mizner was to build a briquette machine which would overcome the difficulties encountered by the former press. No company was organized at that time, but contracts were drawn satisfactory to the people interested.

The following spring, Mr. Mizner built the first Renfrow press, which made briquettes 2 inches in diameter, weighing about 4 ounces. This press had some of the essential features of the present Renfrow press, but made briquettes only at one end of the stroke; that is, 12 briquettes per revolution. After this machine was built it was discovered that the briquettes were too small and that the construction of the machine was too light. Mr. Mizner also developed the idea of making briquettes at both ends of the stroke, thus doubling the capacity of the machine. It was decided to build a much heavier machine, and one making a briquette 3 inches in diameter. Changes were also made in the method of mixing and heating the material. The cast iron vertical heaters of the original press were supplanted with horizontal acketed heaters, using ordinary spiral conveyor flights for mixing and handling the fuel. To this was added a short vertical heater acting as a reservoir, into which live steam was admitted just before the mixture was delivered to the moulds.

The briquetting portion of the Geological Survey coal testing plant at St. Louis during the Exposition has already been described.[12] After the close of the Exposition the "American" machine, installed by the National Compressed Fuel Company, of Chicago, was removed, and early in 1906 the remaining portion of the briquetting plant was destroyed by fire. In rebuilding the plant provision was made for the installation of a Renfrow briquette machine.

This machine was completed in the fall of 1905. Mr. C. T. Malcolmson, of the United States Geological Survey testing plant, inspected this press at the shops of the Ramming Machine Company, at St. Louis, and burned some of the briquettes under a boiler at that plant. Difficulties were developed from the fact that the fuel remained too long in the vertical heaters, and some trouble was also experienced in getting the material from the die-filler to the die proper. Occasionally briquettes would stick in the dies, resulting in a double charge, which finally crippled the machine. Provisions were then made to overcome these difficulties and the machine was rebuilt. The new machine was first tested in March, 1906. The heating capacity was increased so that the charge remained in the conveyors about 15 minutes before reaching the dies, thus allowing the material to become thoroughly heated and the melted pitch to mix with the coal. Brushes were added to insure the charge being carried to its proper position in front of the die, and an ejector, operated by a magnet, insured the delivery of the briquettes from the ends of the plungers. Many of the parts of the machine were strengthened, and steel and bronze substituted for cast iron in the wearing parts.

[12] *U. S. Geological Survey Bulletins* Nos. 261 and 290, and *Professional Paper* No. 48.

The results of the tests on this machine, made under the supervision of Mr. Malcolmson for Mr. J. A. Holmes, expert in charge of the St. Louis fuel testing plant, at the testing plant of the company, resulted in a contract for the rental of this machine by the Government. In May, 1906, the first successfully-operating Renfrow machine was installed at the fuel testing plant. It is shown in Fig. 13.

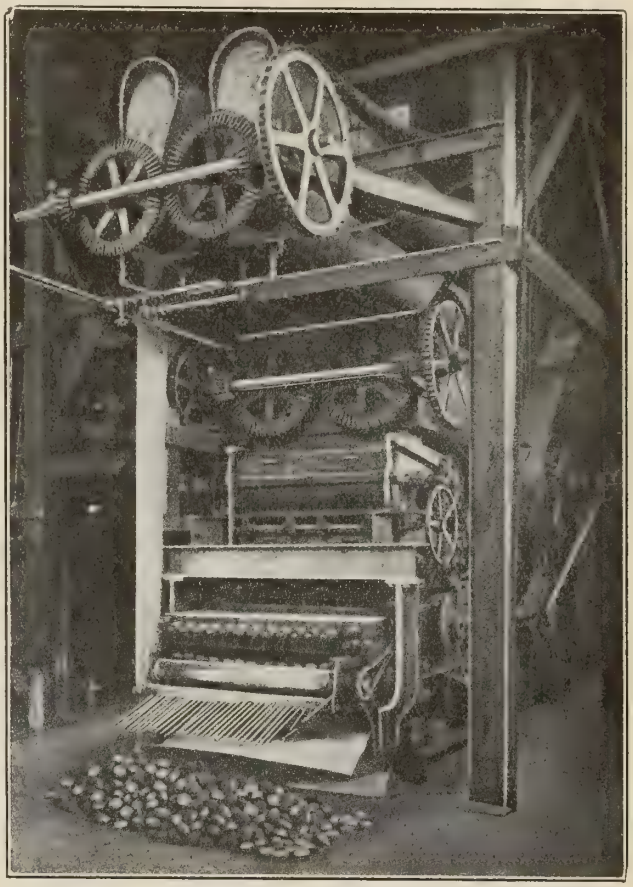


Fig. 13.—Renfrew Briquetting Press.

The result of the tests which have been made on the Renfrow machine from May, 1906, to March, 1907, indicated that the design of this press was, in the main, satisfactory, and that the difficulties experienced were due almost entirely to bad or weak construction of the machine. This machine was the result of many changes, while in many cases it was impossible to strengthen the weak parts owing to the limited space, or the fact that the size of the part was fixed by the original design.

The difficulties encountered in operating this machine at the coal testing plant soon indicated its weaknesses, and as a result the Renfrow Co. designed and built two new presses, one of which was installed and is now being operated by the Western Coalette Fuel Company at Kansas City. The other is now ready for delivery to the fuel-testing plant at the Jamestown Exposition. The new press makes a briquette 3.25 inches in diameter, weighing about a pound. The machine which was operated at the St. Louis fuel-testing plant could not be depended upon to deliver more than 1,000-lb. pressure per square inch on the briquetes without seriously straining the frame of the press. The new machine will deliver a maximum pressure of about 2,500 lb. per square inch without straining the machine. All of the wearing parts not under pressure are made of bronze so as never to become corroded, while the dies are made of

case-hardened steel, which, owing to the abrasive action of fuel, are kept clean and bright. The cams and rollers, originally made of chilled cast iron, are made of case-hardened stool steel in the new machine, and the design of the housing has been so changed that any of the parts can be removed without dismantling the machine. Provision has also been made in the new machine so to feed the heaters that they will always run clean and at the same time keep a full load in the chamber above the die filler. This chamber, while closed in the old machine, is open in the new, which allows the operator to regulate the supply of fuel to the press at all times.

(To be continued.)

PERSONAL AND GENERAL

Mr. J. J. Fingland, of Glasgow, Scotland, has opened assay offices at Sandon, B.C.

Mr. A. J. Goodell, superintendent of the Le Roi Company's Northport smelter has tendered his resignation to the directors.

The Mining Journal congratulates Mr. J. La Barthe, superintendent of the Trail smelter, on his recent marriage. Mr. and Mrs. La Barthe are now enjoying their honeymoon.

The Hon. Jean Prevost, Minister of Colonization, Mines and Fisheries in the Quebec Government, resigned his portfolio at a meeting of the Provincial Cabinet on September 30th.

Dr. Frank D. Adams is expected to arrive in Montreal from England this week. During his stay in London Dr. Adams was in attendance at the meetings of the Royal and Geological Societies.

Mr. T. Hayes-Sheen and Mr. H. J. Carnegie-Williams left Bruce Mines late in September. Both these gentlemen are visiting England in connection with the acquisition of an Elmore vacuum installation at Bruce Mines.

Mr. J. D. Kendall, the distinguished mining engineer of London, England, arrived in Canada on the 6th of October on a visit to his son, Mr. Cosmo Kendall, who is operating the Bell mine, a graphite property near Buckingham, Que.

Mr. R. R. Hedley expects to complete the work of collecting information on the mining and metallurgical industries of British Columbia for the Dominion Government by the end of the year, when he will go to Ottawa to prepare his report.

Mr. H. H. Claudet, of Rossland, representing the Elmira Company, is absent in Califoria, where he is spending his honeymoon. Mr. Claudet has contracted to supply three plants to treat ore by the new Elmore vacuum-oil process in British Columbia.

In consequence of the increased activity in the Omineca district of British Columbia, the authorities have decided to re-open the Government offices at Hazelton, which will be placed under the direction of Mr. F. W. Valleau, who has been appointed gold commissioner.

Advices from Ottawa state that the Deputy Minister of Mines, Mr. A. P. Low, is rapidly recovering from the effect of the slight relapse which he suffered while in the West, as a result of over-taxing his strength there. He is, however, recommended by his medical adviser to take a complete rest and it will, therefore, be some little time before he will return to his duties.

The following gentlemen were elected to membership in the Canadian Mining Institute at a Council meeting held on Saturday, October 5th:—

Corresponding Members:—Mr. M. Walton Brown, secretary of the North of England Institute of Mining Engineers; Mr. Bennett F. Brough, secretary of the Iron and Steel Institute; Dr. Wm. Campbell, Columbia University, New York; Dr. J. F. Kemp, Columbia University, New York; Dr. A. C. Lane, State Geologist, Lansing, Mich.; Dr. C. K. Leith, Madison, Wis.; Mr. C. McDermid, Secretary Institution of Mining and Metallurgy; Dr. R. W. Raymond, Secretary, American Institute of Mining Engineers; and Dr. C. R. Van Hise, President Wisconsin University, Madison, Wis.

Members:—J. W. Astkey, Victoria, B.C.; C. S. Baker, Box 123, Greenwood, B.C.; P. McN. Bennie, Niagara Falls, N.Y.; Charles Biesel, Phoenix, B.C.; W. B. Bishop, Grand Forks, B.C.; L. L. Bolton, Lake Superior Corporation, Sault Ste. Marie, Ont.; Cecil M. Bryant, Vancouver, B.C.; James Buchanan, Trail, B.C.; Lorne A. Campbell, Rossland, B.C.; Nicholas J. Cavanagh, Nelson, B.C.; Thomas W. Cavers, Rossland, B.C.; Andrew Colville, Coal Creek, B.C.; R. C. Campbell-Johnston, 1171 Melville street, Vancouver, B.C.; Dr. Fritz Cremer, South Works, Ill., Steel Company, South Chicago, Ill.; Paul S. Coldrey, Rossland, B.C.; J. K. Cram, Rossland, B.C.; Graham Cruickshank, Rossland, B.C.; W. S. Drewry, Nelson, B.C.; G. W. Dunn, Box 493, Rossland, B.C.; Jacob M. Eggert, New Liskeard, Ont.; Newton W. Emmens, Trout Lake, B.C.; J. B. Farquhar, Dominion of Canada Assay Office, Vancouver; James Findlay, 1428 Robson street, Vancouver, B.C.; A. L. Fowler, Cobalt, Ont.; S. N. Graham, Mina El Favor, Hostotipaquillo, Jalisco, Mexico; R. H. Hewer, Greenwood, B.C.; Lewis Hind, Three Forks, B.C.; A. C. Horton, Cobalt, Ont.; Alexander Kaye, Box 1253, Vancouver, B.C.; A. G. Langley, Box 827, Vancouver, B.C.; O. E. Le Roy, St. Andrews East, P.Q.; James Lockwood, Edmonton, Alta.; George W. McCaskell, Cobalt, Ont.; C. H. McDougall, Phoenix, B.C.; W. D. McGrege, Victoria, B.C.; M. D. McIntosh, Greenwood, B.C.; A. L. McKillop, Nelson, B.C.; W. S. St. J. Miller, Box N., Grand Forks, B.C.; Chas. T. Mitchell, Box N., Grand Forks, B.C.; J. O'Sullivan, 432 Richards street, Vancouver, B.C.; Francis J. Peck, 531-5 Williamson Building, Cleveland, O.; M. E. Purcell, Rossland, B.C.; John Redington, Cobalt, Ont.; Frased D. Reid, Cobalt, Ont.; John F. Robertson, Greenwood, B.C.; Chas. Rundberg, Phoenix, B.C.; James Rutherford, Victoria, B.C.; J. M. Sands, Box 776, Rossland, B.C.; Chas. D. Smith, Box 361, Cobalt, Ont.; O. B. Smith., Jr., Phoenix, B.C.; M. H. Sullivan, Trail, B.C.; Clifford Varcoe, Greenwood, B.C.; E. H. Vaughan, Box 334, Grand Forks, B.C.; Julius H. Warner, Haileybury, Ont.; E. W. Widdowson, P. O. Box 1108, Nelson, B.C.; Wakelev A. Williamson, Grand Forks, B.C.; Franklyn Wilson, Greenwood, B.C.; E. B. Webster, Greenwood, B.C.; L. P. Burns, 478 Front street west, Toronto, Ont.; Lee J. Lockwood, Cobalt, Ont.; Francis N. Flynn, Cobalt, Ont.; Le Rocque, Labelle, P.Q., P. O. Box 826, Montreal, P.Q.

Associate Members:—G. O. Buchanan, Kaslo, B.C.; E. Cave Browne-Cave, P. O. Box 355, Vancouver, B.C.; F. W. Chalmers, Cobalt, Ont.; Gerald Chown, 20 Barrie street, Kingston, Ont.; Martin Cohn, Care McGiverin & Haydon, Ottawa, Ont.; J. W. Collis, Care Mussens, Limited, Box 818, Vancouver, B.C.; Smith Curtis, Rossland, B.C.; A. C. Flennerfelt, British-American Fruit Company, Victoria, B.C.; Harvey D. Graham, Haileybury, Ont.; J. T. Hillis, Box 1028 Vancouver; S. H. Logan, Canadian Bank of Commerce, Cobalt; William Pitkethly, Heaslip, Ont.; Duncan Ross, Greenwood, B.C.; H. E. Wade, Box 716, Nelson, B.C.; E. W. Wauk, Nelson, B.C.

Student:—John N. Morrison, Glace Bay, N.S.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.—Things are going along very nicely around the collieries just now. The labor situation is distinctly easier, more from the fact that the men as a whole are working better than from any influx of labor. The output of the Dominion Coal Company's mines for September will be about 300,000 tons. October will in all probability have the heaviest tonnage of the year. Somehow October is always a banner month in the matter of outputs. Perhaps it is that the miner begins to realize that the harvest is past and the summer ended, or in other words that picnic time is over and that he will want a little saved for the winter. It is a strange thing that the same men that will resist bitterly the reduction of a single mill in their price list will yet lose weeks of valuable time summer after summer, to their own sure detriment and loss did they but realize it. The fable of the grasshopper and the ant has still its application in Cape Breton collieries.

The Dominion Coal Company are now actively engaged in preparing a site for their new colliery on the areas that lie between Low Point on Sydney Harbor and the anticline that is supposed to run concurrently with Briddgeport Basin. The new mine will be known as "Dominion No. 12," and will be a slope mine on the Victoria Seam. This seam has a great reputation locally, and was in much demand when the old Victoria Mine was working. A branch line will be constructed of about seven miles in length to connect the new mine with the Sydney & Louisburg Railway at a point near Grand Lake. In all probability the branch will be completed for the shipping season of 1908. The officials' houses and a number of workmen's dwellings will be erected before the winter sets in. Two slopes are now commenced, and the work of driving will be actively prosecuted throughout the winter, for which purpose a temporary plant is now being installed.

In what are generally known as the Lingan-Victoria areas the Coal Company have a property the value of which is not generally realized. The coal exposure is one of the finest in existence, showing as it does the crop of five workable seams, three of them over seven feet thick, for a length of seven miles or more. The crops are admirably adapted for slope mining under the most favorable circumstances. As yet the most valuable portion of the Coal Company's properties is practically untouched.

The steamer "Cabot" is the latest addition to the Black Diamond fleet. She arrived here on the 20th after a stormy voyage across from her builders, the Grangemouth & Greenock Dockyard Company of Scotland. The "Cabot" is not a very large boat, being about 150 feet over all, and drawing only 12 feet of water. She is intended for small ports trade. She is happily named, the matter of nomenclature being one in which the boats of the Black Diamond line excell, as witness the "Bonavista," the "Catalone" and the "Louisburg," all of which have an old time smack that is good to hear. It is amusing to hear a Cape Bretonian from "way back" or a newcomer from the "Bruce" trying to get his tongue around words like "Borgestad," "Drottning Sophia" or "Fimreite."

The Dominion Government recently passed an Order-in-Council remitting to the Dominion Coal Company the sum of $1,380, being the duty and German surtax paid on the recently imported Draeger life-saving apparatus. One of these apparatus is at present on exhibit at the Provincial Exhibition at Halifax.

Glace Bay and the collieries are still chuckling over the remarks of the Hon. Rubert Drummond in the "Mining Record" on udge Longley's decision in "Steel vs. Coal." His remarks on laminations and layers are particularly illuminating. The "Hon. Bobby," as Mr. Drummond is usually called, cannot see how No. 6 coal could be "commercial coal, well picked," and at the same time "not reasonably free from stone and shale." So far Mr. Drummond is the only writer who has dared to record a protest against the findings of the learned judge, and to the Glace Bay people at least his dissertations are distinctly refreshing.

The following appeared recently in one of the Halifax dailies, and is good enough to quote: "If twenty years ago I had the moral courage to fling away the joys of office, I might have made the world happier and better," said Judge Longley at General Booth's meeting. It is not too late yet for Mr. Justice Longley to go into the Army. The Dominion Coal Company would probably be willing to advance sufficient to buy him a bonnet and tambourine. We daresay they would.

The P. W. A. at their recent meeting in Halifax decided to petition the Government against the use of disc and chain coal cutters in pillar work, urging that they are dangerous in use and make no noise as to drown the "talking" of the roof. A good many pillars have been drawn in Cape Breton recently which have been undercut by these machines, and we have not yet heard of an accident due to their use. We do not think the objection of the P. W. A. is well taken. It is an objection that has been urged time and time again in the mines of the British Isles, but an objection which is now pretty well exploded. The miner who depends entirely upon the "talking" of the roof for his danger signal is running things too closely, and we fail to see why undercutting by machine should be any more dangerous than undercutting by hand. Pillar work in the Cape Breton mines is exceedingly well paid, and there is considerable competition among the miners for places in the pillars with the "little pick." One had thought, however, that this time-worn objection to the mechanical coal cutter had been relegated to oblivion along with the objections made to the spinning mule and the steam locomotive, but such notions die hard.

Labor unions throughout Canada appear to be disturbed over the problem of Asiatic labor, and the P. W. A. also drafted a resolution against the importation of labor of this character. At Winnipeg recently the Trades Congress protested against the importation of skilled European labor. We wonder whether the trades unions of Canada think the commerce of this Dominion can be carried along by the present working population of Canada, and whether this great and growing Dominion can be a close corporation. Laboring men are needed in Canada. They are needed to-day in large numbers, but to-day's needs will be eclipsed and forgotten in to-morrow's greater needs. For the working classes of Europe Canada is now "God's Country," a title to which our southern neighbors are fast losing their right. Any attempt on the part of any body of men to restrict the present rate of emigration to Canada can only hinder the progress of our commercial prosperity, and for this reason will almost necessarily be an abortive attempt. As we see it "it is up to" the Canadian workman to see that he becomes the patrician in the ranks of labor in the Dominion, that from out of the influx of foreign labor he wrests promotion and advancement for himself. His are the rights of patrimony and primogeniture, and if he plays his part well, no one can take them away from him.

We suggest to some of the labor unions of this Province that instead of fighting the chimera of Asiatic immigration they enquire why it is that when a capable superintendent is required for the Steel Works he has to be imported from Alabama, U.S.A., or from across the water, and why so many lucrative positions in both mines and steel works are being filled by men who have the necessary technical and theoretical training gathered in other parts of the world. The Nova Scotian Government are patting themselves on the back because they contemplate the expenditure of $100,000 on technical education, and truly this is a beginning. Only a beginning, however. Over $400,000 per annum is spent in Cape Breton for "rum." The Sydney Town Council offered to give $400 to technical education as represented by the Cape Breton Technical School last winter. They collected a lot more than

this in Scott Act fines. Charity begins at home, they say. Asiatic labor in Cape Breton is a pipe dream, a bogie to scare children with, but there are real evils to be fought right here. One is "rum," the other in plain English is ignorance. This may be strong language, but unless the native miner wishes to become the helot of the newcomer he must be afforded and take advantage of the opportunities for self-advancement and technical study that are so freely offered both in Europe and in the United States. Almost all the theoretical and technical knowledge among the lower officials in this Island was despatched from Scranton, U.S.A. That is to say, the portion of it which was assimilated. All of it was paid for, and it would be an interesting thing to know just how much money had gone across the border for correspondence lessons that could very well have been expended this side of the line.

The Commission to enquire into Relief Societies at the collieries and the matter of Old Age Pensions finished its labors in Glace Bay last week. A considerable amount of evidence was taken, which will doubtless form the subject of a Government publication. Old age pensions appear to be in the air just now, for much is being said and written on them both here and over in England. We do not think, however, that old age pensions exactly appeal to the more deserving classes of the British Empire, particularly those who reside in Canada. Over here we appear to have absorbed something of the aggressive individualism of the United States, where they are said not to need such pensions, because at sixty a man has either made his "pile" or is dead. However this may be, we cannot see why miners as a class are any more deserving of old age pensions than other classes in the community. We grant that as a rule they live longer, but why they should be entitled to special consideration in this matter is not quite apparent. There are trades fully as hazardous as the miner's and not half so well paid, as for instance, the deep sea fisherman, the alkali and cement worker, the steel worker, and the railroad man. If, however, old age pensions ever become an accomplished fact in Nova Scotia, there should be no large Governmental grant, and no suspicion of charity about it. Compulsory payment by a prospective beneficiary from a certain age, say 20 to say 50 years of age, or in other words the purchase of a guaranteed annuity by compulsory instalments is the only equitable and workable basis on which old age pensions can be obtained. We do not imagine that the average Canadian is much exercised on the subject of old age pensions. Life is too short.

The Dominion Coal Company have made somewhat of a departure in their management organization under a circular issued this week. Mr. Peter Christianson, who has for a long time been the assistant superintendent of mines, is now appointed mines superintendent of district No. 1, which comprises collieries Nos. 1, 8, 5 and 10, and Mr. Norman McKenzie, for some time past the manager of Nos. 2 and 9 collieries, is appointed mines superintendent of district No. 2, comprising collieries Nos. 2, 9 and 7. Each of the collieries named will have its own manager. In creating this new office of district superintendent the Coal Company have opened up a new avenue of promotion for their managers, and we think the appointment will give general satisfaction.

ONTARIO.

COBALT.—The Coniagas concentrating mill is in full operation and is proving a decided success. It consists of Blake crushers, three jigs, a Huntington mill, one Wilfley table and two Frue Vanners, the total capacity of the mill being 100 tons a day. Mr. Fraser Reid, formerly of the Canada Corundum Company, Craigmond, is in charge of operations.

The Buffalo mines are constructing a similar mill and expect it to be in full operation in a few weeks.

The Nova Scotia have installed a new compressor. Some very rich ore is being mined here, their new discovering having proved to be regular bonanzas.

The strike, to all outward appearances, is a thing of the past. All the mines are operating in full force and men seem plentiful. Organizer Roadhouse's appearances on the Square are growing scarcer since his following has diminished to a few men, who seem to enjoy his peculiar style.

A widely signed petition is being circulated among the citizens of Cobalt to prevent the reckless blasting by the mining companies and railroad contractors. It is to be hoped that some means will be taken to prevent this unnecessary danger, whoever is to blame, the miners or the railroad workers.

The Kerr Lake mine is constructing a large number of buildings, including one of the finest sleeping camps in the district. A commodious engine room has just been completed, and a new compressor installed. There has been remarkable progress made on this property during the past few months.

A remarkably rich vein of calcite, smaltite and native silver was discovered on the Silver Leaf property last week. It is fully 18 inches to 2 feet in width in some places. The discovery was made while trenching.

The City of Cobalt uncovered a couple of rich veins last week. This property is showing up well under systematic development work.

Mr. Wm. Nicol, Professor of Mineralogy at Queen's University, has returns to Kingston after a visit of some weeks in the camp, where he has been gathering specimens for the Department of Geology and Mineralogy at the University. Prof. Nicol spent the early part of the summer in Germany.

Mr. Barnett, M.E., of London, England, is at present in the camp, representing British capital.

Thos. Burkett, M.P., of Ottawa, director of Cobalt Lake Mining Company, also the City of Cobalt, was in town last week.

J. M. Clark, K.C., Toronto, spent a few days in camp last week.

A remarkably large vein of cobalt and silver has been struck on the Temiskaming & Hudson Bay property. This property adjoints the Trethewey, and, during the summer development work has shown it to be a bonanza property.

The concentrator at the McKinley-Darragh is now in full working order. The crushing is done by a stamp mil land concentrated by vanners. It has proven so successful that the company intend to put in another twenty stamps. This property, under the management of Capt. Harris, has been making remarkable progress.

The O'Brien mine is installing a new power plant. The boilers are already in place and they expect to have their twenty drill compressor at work very soon. They are also installing a new electric plant.

ALBERTA.

CANMORE.—The H. W. McNeill Company, of Canmore, Alberta, are opening up a new vein of coal on the eastern side of their property. This vein, known as the Sedlock vein, was prospected several years ago and found to be a good steam coal. Owing to the present great demand for steam coal, the company has thought it advisable to develop this new vein and increase their present output. About 200 men are at work on the spur line, which runs from the main C. P. R. track to the tipple at the Sedlock mine. This spur line is a little over one mile in length and of a good grade throughout, although the cutting in hard limestone rock is at some points very heavy. It is expected that the steel will be laid in a few weeks, by which time the large staff of men employed building the mine tipple will have completed their work. It will be some time, however, before a large output can be expected, as the mine workings have all to be opened out, nothing having been done inside the mine except the driving of a few trial drifts.

HILLCREST.—The Industrial Disputes Investigation Act has been brought into force at Hillcrest, Alberta, where there is a dispute between the Hillcrest Coal Company and the United Mine Workers of America regarding the wages to be paid miners. President

F. H. Sherman of the U. M. W. A. is representing the men, and Mr. John R. Macdonald is representing the Hillcrest Coal Company on the Arbitration Board. The board having failed to agree on a chairman, the Minister of Labor has appointed C. W. Fisher, Speaker of the Alberta Legislative Assembly, to act as chairman.

MORINVILLE.—The following resolution, passed by Morinville Miners' Union, has been forwarded to Sir Wilfred Laurier:

Whereas the time has arrived in the history of Canada when the Government must choose between an Asiatic or a Canadian British Columia;

And whereas the present influx of Asiatics into the Province of British Columbia must inevitably lead to constant clashes between the two races, resulting in rioting, destruction of property and murder;

And whereas this state of affairs threatens the solidarity of the Dominion, and must result ultimately in the secession of British Columbia or war with Japan;

And whereas it is the working man who is called upon in the time of war to bear the brunt of the fighting, and it is labor that backs every fund for the repayment of expenses incurred by war;

And whereas war is hell;

And whereas it is the belief of the working men of Western Canada that these unassimilable alien races are being allowed to enter Canada to suit the convenience of railway corporations, lumber operators, and other trust concerns;

And whereas now it is a matter of choice with the Dominion Government whether they should decide with Canadian working men and peace or with the corporations for an Asiatic British Columbia and ultimate war;

Therefore be it resolved:

That the Morinville Miner's Union, No. 2378, of the U. M. W. of A., regard as a national menace the delay of the Dominion Government in the face of such a crisis, and as citizens of Western Canada we call on you, Sir Wilfred Laurier, your Cabinet and the Dominion Government to take immediate action to avert a national calamity by passing an Absolute Asiatic Exclusion Act which will for all time preserve Western Canada to the white race, and this resolution is passed with the full knowledge that the ever-ready argument of "Imperial" reasons might be brought forth to answer this, as it has served to answer other and similar resolutions, but with this fetich we have little patience and less faith.

The Morinville mines are situated about 20 miles north of Edmonton and employ about 60 men underground. The output is 400 tons per day. This camp has been "organized" by the U. M. W. of A., and has now been a "union" camp for about four months.

EDMONTON.—The men employed by the City Coal Company, Edmonton, have been organized by Organizers Patterson and Galvin of the U. M. W. of A. Twenty men are employed in the City Coal Company mine, and all have joined the union.

BRITISH COLUMBIA.

FERNIE.—Senator Cox, of Toronto, president of the Crow's Nest Pass Coal Company, Limited, interviewed at Vancouver, B.C., emphatically denies the report that G. G. S. Lindsay, K.C., general manager of the Crow's Nest Pass Coal Company, is about to retire from his position with the company.

Rev. Hugh. R. Grant, late of Fernie, B.C., now of Pincher Creek, Alta., has been appointed chairman of the Joint Committee of the Western Mine Operatorss' Association, and the United Mine Workers of America. The reverend gentleman was very popular amongst the miners while stationed in Fernie, and his appointment as chairman of the Joint Committee meets with general approval from all interested in mining matters.

HOSMER.—The Hosmer Miners' Union has applied for a Board of Investigation under the Industrial Disputes Investigation Act, and their application having been favorably received the Board has been formed. President F. H. Sherman, of the U. M. W. of A. will act on behalf of the men, while Frank F. Smith, mining engineer, of Edmonton, will act on behalf of the Hosmer Mining Company. The chairman of the Boar dis Judge Wilson, of Cranbrook, B.C.

THE KOOTENAYS.—Conditions in this district during the past couple of weeks have been very satisfactory. Things are really a little quiet at present, and those who speak for the various industries lay the cause to the coke and fuel shortage, scarcity of money, the fall in the price of copper, etc. Many of the mining shares have taken a marked slump, some of the mines have reduced their working forces, and the demand for lumber and telephone poles has fallen off to a considerable extent.

Trouble between the miners at Lethbridge and the coal mine operators has come to the surface again. It is the same old story. The men want their time to begin when they take up their tools and start for the face, while the operators claim that the day's work begins when the men arrive at the face of the workings. The miners also complain that the machinery is started about ten minutes ahead of time and left running until ten or fifteen minutes after quitting time, and it is imperative that they remain at their posts until the machinery stops to avoid breakages and accidents. The men are working ahead and the affair will be arbitrated if both parties can agree o na board, which they are haggling over at present.

There is quite a scarcity of coal miners along the Crow's Nest. The Crow's Nest Pass Coal Company and the Canadian-American Coal & Coke Company have had to look into outside districts for men. About forty miners recently came from England to work for the first mentioned company, and Manager Moore of the latter corporation has been to Montana in search of help, but finds that men are more scarce there than in the Crow's Nest district.

The Great Northern has a force of men engaged in making a permanent location of the Great Northern line up the Elk River from near Michel. This railway, from Fernie, B.C., to Calgary, Alta., will traverse rich coal fields all along its line. The grade is less than one per cent. The surveyors will try and carry their work as far as the summit between the headwaters of the Elk and Kanakaskis Rivers, an elevation of about 6,500 feet, before the weather conditions make it impossible for them to go farther. About 800 men are now at work on the grading and bridge work for part of the road from Fernie to Michel.

The St. Eugene mine, of the Consolidated Company, has entered into a contract with European buyers for part of their output of concentrates.

The Hewitt mines, near Silverton, which is owned by New York interests, now has 35 men on the pay roll and about 60,000 tons of ore blocked out. On a car of ore recently sent to Trail smelter good returns were realized.

Matters are looking a little brighter in the Slocan. It is rumored that an important strike was recently made at the Westmount mine on Slocan Lake. They are diamond drilling at the Arlington and they are working again at the Ottawa.

The Rossland mines are shipping every day and while things are quiet the industry is in a healthy condition. Mr. F. W. Warren, of White Bear fame, was in the city recently, and reports that affairs with the White Bear mine are looking better.

In the Boundary, the Dominion Copper Company is thinking of enlarging its smelting capacity. They can at present treat about 1,200 tons of ore per day. For the week ended September 28th the Granby shipped 23,000 tons of ore. This is the greatest quantity they have ever shipped in a week. One day they shipped over 4,000 tons. The total shipments from Phoenix for that week were 41,000 tons, which made a new record. So it will be seen that the mines of this district are still shipping a rather bulky tonnage, despite the fact that many of the copper producers in

the United States have cut down their production almost as much as fifty per cent. in some cases.

This is an age of arbitration. Now the Crow's Nest Pass Coal Company and a Government nominee, J. A. Mara, are going to select a third arbitrator between them, and the three will thresh out the coke shortage proposition. It is to be hoped that their efforts will result in more fuel.

It is understood that an agent for the Orientals on the coast has been making overtures to the Boundary mining men and the coal operators of the Crow's Nest district towards furnishing them with cheap labor to operate their mines. Feeling is still running high throughout this country against Asiatic immigration in unlimited numbers, and it is hoped and trusted that the Government will find some means of checking this yellow stream.

Granby shareholders will soon be receiving cheques for the eighth dividend of that company, amounting to $3 per share, or a total of $405,000 for the 135,000 shares issued. During the fiscal year ended June 30th last the Granby Company produced about 20,000,000 pounds of copper and realized somewhere about 22 cents per pound for it.

KOOTENAY.—Although there is a tightness of money for investment, and mining stocks in common with others have undergone a severe reaction, there was probably no time in recent years when more capital is seeking bona fide investment in the mines of Kootenay than the present. In the Big Bend country, to the north of Revelstoke, three hydraulic properties have employed a considerable number of men this season. The Revelstoke and McCullough Creek Company have taken out a quantity of gold. The French Creek hydraulic property is being operated by Mr. Vance on behalf of Mr. Hoover, a mining investor of Indiana. Pittsburg people are putting in a hydraulic plant on Smith Creek, the work being done under the supervision of Mr. Guffy.

Spokane parties had an option on the Downie Creek copper properties, but after spending a good deal in opening up the trail to the ground they have thrown up the option without having done any development work on the property.

The Standard mine, in the Big Bend, is a copper property which has been developed to a depth of 550 feet, but is at present shut down for want of funds.

Development work is being pushed on the Lightning Peak properties at the head of Fire Valley, and the first shipments of ore from this camp will be made this winter.

Spokane parties have been up examining the Big Ledge, a large low grade zinc property on Pingston Creek, and tributary to upper Arrow Lake.

At Rossland the mines never looked better. The Le Roi, Le Roi No. 2, War Eagle, Centre Star, and White Bear are working steadily and shipping. The Le Roi Company have now completed their five compartment shaft to the 1,650 foot level, and have cross-cut the ore body there for 30 feet, besides drifting on it 150 feet each way. There is a fine showing of ore on this new level—the lowest in the mine. As the ore body is not yet cross-cut from wall to wall its width is unknown.

The north vein on Le Roi is now developed to the 300 foot level, and contains the ricehst ore yet found in the mine.

The new company organized to operate the California and Giant art pushing development work on both properties with every prospect of success. The ore bodies in Le Roi No. 2 have now been developed to the boundary of the California, and as the ore continues strong and of good values in the face, the new company, which is composed mainly of the original founders of the Granby, begins its operations under most promising auspices.

Scotch capital has become interested in a copper-gold property in South Kootenay, where there is a large quantity of ore in sight, and should future development warrant it the intention is to add a smelting plant.

The Trail smelter has had two copper furnaces shut down owing to want of coke, but the situation is improving. This smelter continues to make big improvements to meet the increased mineral production of South Kootenay, and is adding a number of Hebberlein roasters to those already in use. The lead refinery is being extended, and the lead pipe manufacturing branch of the business turns out a large quantity of piping of first-class quality. This industry is a great credit to Canadian enterprise.

Things are looking up in the Slocan. New capital is coming in. The profits made by leasers have had the effect of throwing new life into this well-known camp. Old properties are being re-opened and new ones are being developed.

The Blue Bell mine, being operated by the Canadian Metal Company on Kootenay Lake, is showing an immense body of ore. A new mill is being completed, and the mine put in shape for a large output. The mine will start shipping next month.

Poplar Creek, which a few years ago created a sensation by the immensely rich gold specimens produced in the camp, is again attracting attention. New York parties are developing the Calumet and Hecla on Rapid Creek with great success. John Keen, of Kaslo, is developing a property on the hill behind the town. Boston people, under the management of E. Mobbs, have taken up the Smith and Rogers property at Poplar Creek and intend putting in a stamp mill.

In the Lardeau, the Silver Cup, which has been a shipper of high grade silver ores for ten years, is looking better than ever. The mine is now developed to a depth of 800 feet. The ore averages an ounce in gold to the ton and nets $150 after payment of mining, transportation and smelting charges. A hoist was recently installed to sink a shaft with a view to testing the ground at depth before running another long tunnel, and a 30 drill compressor is now being installed.

The Ohio Development Company, which has been operating the Broadview mine at Trout Lake, has sold that property and is now erecting bunk houses and buildings with a view to starting operations on the St. Elmo, Blue Bell and True Fissure, which the company has recently acquired. This is a remarkable property, having 4 1-2 acres of low grade ore exposed on the hanging wall of the main vein with cross veins carrying high values. Considerable development work has been done on the Blue Bell claim of this property. It is intended to mine the higher grade of ore this winter and make some shipments to a smelter.

A deal is on for the Eva and Oyster-Criterion, two well-known free gold properties at Camborne. The idea is to consolidate them and equip them with a large mill. There is plenty of ore, but it is low grade, and successful operation i sa matter of reduction of cost of mining and milling. There is no question as to the quantity of ore, Lexington Mountain, where these mines are located, being traversed in all directions by gold-bearing veins having anaverage value of $5 per ton. The Eva mine is now doing remarkably well in the matter of costs, ore being mined by glory-hole methods and delivered to the mill for 45 cents a ton, and the milling is done at similar cost. A compressor plant has been recently installed in the Eva. Mr. racey, M.E., is entitled to great credit for his management of this property.

W. J. Butler, owner of the Lucky Jack mine, one Lexington Mountain, has arranged to put in a two stamp mill to assist in the development of the property.

The Silver Dollar mill has started running, but it was intended for gold ores, whereas development is proving the mine to carry silver-lead rather than gold values.

The Edward Baillie Syndicate, owners of the Mammoth, a high grade gold-silver property on Fish Creek, intend to put in an aerial tramway.

GENERAL MINING NEWS

NOVA SCOTIA.

ANNAPOLIS.—At the Torbrook iron mines the Springhill strike is being felt indirectly. The mines are suffering badly from shortage of coal. No doubt this will be remedied very rapidly. It is the intention of the Annapolis Iron Mining Company to develop power at Nictaux Falls, about a mile from their mines. The power will be transmitted to the mines electrically. The cost of power installation at the Falls is estimated roughly at $50,000.

SPRINGHILL.—Owing to the refusal of the miners to accept the award of the Board of Arbitration and to the consequent continuance of the strike, it is possible that the Nova Scotia Government will be asked to operate the mines of the Cumberland Coal & Railway Company, pending the settlement of the strike. The Town of Springhil lis suffering badly from the present inactivity.

Deputy Minister of Labor MacKenzie King visited Springhill on October 3rd and 4th. After discussing the situation with the workmen, Mr. King wrote to General Manager Cowans requesting him to give some assurance about the resumption of work and the filling of contracts for coal with the Intercolonial Railway. Mr. Cowans replied that the men had refused to abide by the decision of a legally appointed Board of Arbitration, and that the company could not, in the face of this, take any further action or make any assurances in regard to the contracts. Thus, unless the strike is settled, the I. C. R. will be forced to place a 60,000 ton contract in the United States.

ONTARIO.

WABIGOON.—The Paymaster Shaft has attained a depth of 300 feet. The plant is being added to, buildings are under construction and, below, the ore chute looks well.

SUDBURY.—Mine No. 1 of the Moose Mountain Iron Mining Company is putting out a large quantity of iron ore daily. The ore is stacked for shipment in the future. On mine No. 4 a diamond drill is being used for prospecting purposes. Under Superintendent Leach the settlement composed of the workmen's residences has assumed a neat and attractive appearance. Foundations are being laid for the installation of power plants and crushing machinery.

COBALT.—During the present month the directors of the Foster Cobalt Mining Company will issue a statement to shareholders showing the exact financial condition—proceeds from shipments and detailed information regarding the workings of the property. Shipments of ore have been maintained regularly, and it is expected that they will continue. Sinking on vein No. 5 has now reached a level of 140 feet, and drifting will be proceeded with in three directions, following the course of veins 5, 1 and 2. The property is thoroughly prepared for economical and satisfactory work throughout the winter, permitting development work and ore extraction to proceed concurrently. Shaft No. 6 has been closed, and all ore will be handled from shaft No. 5. Sinking on No. 1 has extended to forty feet. The assay office is just completed, and will be in operation within a week. A complete summary with plans above and below ground is nearing completion. Blue prints, kept up to date monthly, may be examined at the head office of the company after November 1st.

A four foot vein with mineral deposit in the vein eight inches and heavily shot with silver, is reported to have been struck in the Silver Leaf property. The find was made while laborers were prospecting about 450 feet from the main shaft.

Manager Lang of the City of Cobalt, reports the new vein to show about eight inches of ore averaging a considerable amount of silver to the ton.

A three inch vein of calcite, rich in native silver, was found last week close to the main shaft of the Solar Cobalt. The shaft is now down about 50 feet.

Rapid progress is reported in the erection of plant for the Cobalt Concentrators and also the Muggley concentrator.

Only two mining companies secured Ontario charters last week. One is capitalized at $2,000,000 and the other $600,000.

The T. & N. O. Railway will in future refuse to permit the loading and unloading of dynamite at Cobalt. A spur line is under construction by which all shipments of explosives will be sidetracked to a suitable storing place. No small quantities of high explosives will be handled by the railway.

The weekly bulletin of the Cobalt Lake Mining Company reports the north shaft down to 26 feet. The south shaft is now down 65 feet. Cross-cutting and drifting are being extensively begun.

The Cobalt Concentrators, Limited, are installing machinery in their new plant. Foundations are completed.

KINGSTON.—The Kingston & Pembroke Railway has just moved the first shipment of iron ore from the Wilzurn mines to Renfrew, whence it was shipped to Sault Ste. Marie. This is the first shipment of a hundred thousand ton contract. A new electric plant is being installed at the mine, so that men can work night and day. The Kingston & Pembroke will on November 1st have a special train and crew to do nothing but handle the ore, taking it from the mines to Renfrew. At present they are moving 250 tons a day, and when all the machinery is installed they will be able to load a train in one hour.

ALBERTA.

FRANK.—The Leitch Collieries, which owns the townsite, has at present a small office building up and Townsite Agent Radcliffe has his office built. Aside from a small residence for the mine engineer, there are no other buildings as yet, but four cars of lumber passed through Frank yesterday for Hamilton, and without doubt there will be much building activity almost at once. The C. P. R. is now engaged in putting in a side track for unloading supplies, the grading for the yards of the local coal company is in progress, and the company has its underground work in shape to begin shipping coal as soon as the yards are ready.

BRITISH COLUMBIA.

PHOENIX.—It is estimated that the Consolidated Mining & Smelting Company employes 1,500 men and pays in wages annually $1,750,000. The operation of its mining properties costs $3,500,000 annually, and its tax bill is $50,000.

VANCOUVER.—The Ikeda mine recently shipped 80 tons of ore to Ladysmith. One hundred and ten men are employed in the Ikeda and three tunnels are being driven. A tram line six thousand feet long connects the new wharf with the mines. The Ikeda copper ore carries about $5 in gold per ton in addition to its copper contents.

Mr. W. G. Trethewey, lately of Cobalt, has bonded a copper property near Collinson Bay, Moresby Island.

The Southern Cross Mining & Smelting Company has been organized for the purpose of putting up a smelter near Alberni. English capital has been interested.

BOUNDARY.—The ore output of the Granby Consolidated for the week ending September 28th was the largest on record. Twenty-three thousand tons of ore were shipped for the week, and in one day 4,000 tons were shipped.

EAST KOOTENAY.—At the meeting of the stockholders of the Sullivan Mining Company, in the last week of September, Manager Dedolph of the smelter advised that the company expend between $65,000 and $75,000 to increase the capacity of the smelter. He stated that the smelter should be increased from 100 to 200 tons. This would require three new roasters and 10 concentrators.

According to the annual statement of the affairs of the Sullivan Group Mining Company, given at the annual meeting, the operating profit of the company for the year ending August 31st, 1907, was $77,091.94. The bullion account due the company is $472,091.42, the bonds for which the company is liable amount to $400,000, the interest for which the company is liable to September 1st amounts to $6,22567, and the net gain to the company as a result of the year's work, after the payment of all interest, is $45,441.56. The receipts from the sale of bullion for the year were $374,286.74. The company has purchased the Big Dipper and Euphemia Fraction mineral claims, and has taken an option on the Commonwealth. The proposition to expend the above mentioned amount on the smelter was opposed by Manager Finlay of the Sullivan mine, who claimed it was unwise to expend much money in increasing the capacity of the smelter when the ore reserves were not known. He said the company did not yet know what it had below the 100 foot level, and he believed the company should sink a shaft another 100 feet in depth, so as to find if the ore continued at depth, before any such increase should be attempted. He said there was enough ore in sight to keep the smelter going at its present capacity for ten months or a year.

Rossland.—The coke supply is becoming much more regular. Five of the seven Trail furnices are in blast. Le Roi mine shipped 1,575 tons of ore to the Northport smelter during the week ending September 21st, and Le Roi No. 2 shipped 560 tons to the Trail smelter.

Coal Creek.—Another disaster occurred at Coal Creek mines by which one man met his death and another was seriously injured. A premature explosion in No. 9 mine is supposed to be the cause, but as usual in cases of this sort the affair is veiled in mystery. The name of the dead man is Peter Johnson. The wounded man's name is John B. Deballiste.

Michel.—A party of fifty miners arrived here from England last night to work in the mines.

The management of the mines expect to soon be working full handed.

They are, however, confronted by a serious situation, being unable to find boarding room for men already here. It was expected that the new boarding house just being completed would relieve the situation. However, accommodations are still inadequate. Every house in camp in filled. One cause is that very many of the miners have sent for their families during the past few months. As many as thirty families are now waiting for houses.

The only relief will be for the men to build houses themselves. In the new town many lots have been sold, but no houses are yet being built.

Nanaimo.—The dispute between the management and the drivers at the Nanaimo coal mines has been amicably settled. The men have gone back to work after four days' idleness. An agreement covering two years has been effected, making a 10 per cent. bonus a fixture.

Nelson.—The Kootenay Engineering Works has contracted to build a 1,000 ton ore bunker for the Hewitt Mining Company. It will be placed at the lower terminal of the tramway. A 300 ton bunker is being built at the upper terminal, near No. 6 tunnel.

MINING NEWS OF THE WORLD

GREAT BRITAIN.

The centenary celebration of the Geological Society of London opened at the House of the Institution of Civil Engineers, Westminster, on the 26th of September. The president, Sir Archibald Geikie, delivered an address on "The State of Geology at the time of the foundation of the Geological Society. In the evening of the same day the official dinner was held at the Metropole Hotel, while on the following evening the Geological Society Club entertained the foreign and colonial delegates at dinner at the Criterion Restaurant, followed by a conversatione at the British Museum of Natural History, South Kensington. The third and subsequent days were devoted to excursions to various centres of geological interest. Canada was represented at the convention by Dr. Frank D. Adams, of McGill University.

GERMANY.

The electrical production of steel is making much headway in Germany, where experiments with various types of furnaces are now being conducted. Recently the plant of the Rochling Iron & Steel Company, at Volklingen, was inspected by representatives of the iron and steel trade. Here a new type of furnace, founded upon a combination of the original Kjellin furnace, is in use. The furnace has a charge of three tons, and purifies a liquid charge from the basic convertor down to mere traces of sulphur and phosphorus.

FRANCE.

At the congress of miners of the centre of France, held recently at Commentry, one of the questions discussed was what attitude should miners assume in the event of ware being declared. Finally a resolution to the following effect was passed: "The National Federation of the Miners of France ought to respond to a declaration of war by a general strike." This in no wise discounts some of the unpatriotic utterances of certain anarchistic delegates to a labor convention at Winnipeg.

AFGANISTAN.

According to a report of a commercial agent of the United States Government, Afganistan is an extraordinarily rich mineral country. It is known to have mines of rubies, topaz, lapis lazuli, mable, iron, lead, copper, antimony, and other metallic ores, as well as sulphur and several of the earthly alkaline and metallic salts. Coal is also found. The lead, iron and precious stone mines are partially worked by the Government with modern machinery, but the mining of the country is mostly carried on by the crudest of methods and the bulk of the mineral wealth is not yet touched. The Amir continues to gradually purchase mining machinery as he has funds; but both Government and people are opposed to granting any concessions to foreigners.

SOUTH AFRICA.

The Legislative Council of the Cape has passed a bill imposing a profit tax of 10 per cent. on diamond and copper mining companies earning over £50,000 per annum, and providing that a defined dividend on preference shares in mining companies shall be taxed at the rate of two shillings on the pound.

The gold output of the Transvaal in fine ounces for the eight months ending August 31st is given as 4,226,470, valued at £17,952,905. This compares very favorably with the returns for 1906, which were 5,786,617 ounces, valued at £24,579,987. The production during August was a record achievement, the yield being 555,027 ounces.

It is stated that the replacement of Chinese in the mines by raw native recruits was adversely affecting working costs. Many of the Chinese are being repatriated against their will, and had even offered large sums of money to be allowed to remain in the country.

AUSTRALASIA.

The new Australian tariff places a rather serious tax on the mining industry in that the duty on mining machinery has been materially increased. Thus the old duty of 12 1-2 per cent. on mining engines and machinery has been increased to 35 per cent., with a preferential duty of 25 per cent. on articles of British origin. In nearly all materials used in mining a considerable increase in duty impost is also to be noted.

The gold output of the Commonwealth for the eight months ending August 31st was 2,083,863 ounces, or a decrease of 222,669

ounces compared with production for the corresponding period of last year.

Several new alluvial gold discoveries are reported to have been made recently in Victoria, and a nugget of 114 ounces has been found in the Poseidon field, which has resulted in reviving interest in the district.

NEW ZEALAND.

The Government of New Zealand is now offering a bonus on the production of marketable copper from ores mined and smelted in the country; and a bonus of four pence a pound on the production of the first one hundred thousand pounds of quicksilver, free from impurities, from any New Zealand mine. In respect to copper, the conditions are that if 1,000 tons are produced on or before June 30th, 1909, the bonus payable will be £1,000; after that date, £500 will be paid on respectively the second and third thousand tons produced.

UNITED STATES.

During the past two years and a half the productive capacity of iron furnaces in the United States has been increased to the extent of four million tons per annum, so that on July 1st of this year the actual productive capacity of the plants is about 27,700,000 gross tons per annum. Since that date still other furnaces have been blown in. For the first six months of this year the production was 13,478,044 tons.

The report compiled by the Minnesota Tax Commission, after exhaustive investigation, has developed the fact that the iron ore resources of the Lake Superior region are greater than a previous estimate. Thus in the Gopher State alone no less than 30,591 acres of iron lands, estimated to contain 1,135,000,000 (roughly) tons of ore, have been proved, the greater proportion being credited to the Mesabi range.

Several of the copper districts, in which the Amalgamated Copper Company have no interest, expect to benefit by the shut down of the Butte mines. This is especially the case in the Black Hills region, where recently some important strikes have been made. Meanwhile, already about fifty per cent. of the miners have been laid off in the Butte district, while the large copper concerns in Arizona have curtailed production very considerably.

The small electric smelter at Heroult, Shasto County, California, to which reference was previously made in this column, is now producing ferro-silicon at the rate of two tons daily. Directly the plant for making electrodes is completed the production of pig iron by electric smelting will be resumed.

The discovery of deposits of asbestos in the Province of Ilocos Norte, in the Philippines is announced. The mineral is found as a stockwork in the serpentine formation of the district. Two varieties of the mineral occur, namely, the true crysolite asbestos and tremolitic or amphibole asbestos.

Clarence Mackay has regained control of the Yellow Jacket mine, in Nevada, once owned by his father, John W. Mackay, who lost it to Robert Morrow many years ago. Morrow held on to it, and seemingly it was his for years to come. The Mackay interest in it was an unknown quantity and was not heard of until it suddenly asserted itself.

Commercial Note

The catalogue of Belliss & Morcom, Limited, has been received from their Canadian agents, Laurie & Lamb, 212 Board of Trade Building, Montreal. The catalogue is admirably illustrated with diagrams and engravings. The B. and M. patent self-lubricating, quick-revolution engines, direct, belt or rope driven. Their engines for electric lighting, power, traction and mill driving are the subjects of this catalogue.

Company Notes

A statement issued late in September by the Dominion Iron & Steel Company shows that its claim against the Coal Company amounts to $1,796,000. This is made up of $289,000 paid to the Coal Company in excess of $1.28 a ton, while the balance the company claims is damages.

STATISTICS AND RETURNS

Dominion Coal Company's output for September:—

No.	1907 approx.	1906 actual.
1	41,130	41,186
2	55,450	52,636
3	26,800	31,971
4	39,720	50,741
5	58,360	57,981
6	18,540	14,468
7	.....	12,028
8	19,700	23,271
9	28,800	34,420
10	8,500	5,031
	297,000	323,733
Shipments	287,150	333,779

Following are the ore shipments and smelter receipts in Southeastern British Columbia for week ending September 21st and year to date:—

	Week.	Year.
Boundary	41,493	882,078
Rossland	7,112	194,280
East of Columbia River	2,782	100,283
Total	51,387	1,176,641

	Week ending Sept. 28 Ore in pounds	Since Jan. 1. Ore in pounds
Buffalo	60,000	1,858,830
Foster	128,000	447,300
Nipissing	178,210	4,090,291

	Oct. 5. Ore in pounds	Since Jan. 1. Ore in pounds
Buffalo	80,000	1,838,830
Coniagas	65,000	4,622,820
Cobalt Central	.....	101,360
Colonial	.....	74,250
Drummond	.....	44,090
Foster	.....	447,306
Green-Meehan	.....	196,780
Hudson Bay	.....	45,170
Imperial Cobalt	.....	37,530
Kerr Lake (Jacobs)	.....	373,780
La Rose	.....	1,229,852
McKinley	172,260	360,260
Nipissing	.....	4,090,291
Nova Scotia	.....	156,000
O'Brien	.....	2,281,014
Red Rock	.....	40,000
Right of Way	.....	134,530
Silver Leaf	.....	43,518
Silver Queen	65,000	837,157
Trethewey	118,990	1,530,008
Townsite	.....	150,078
Temiskaming	.....	229,011
University	.....	61,388

The total shipments for the week were 501,250 pounds, or 250 tons.

The total shipments since January 1, 1907, are now 18,955,820 pounds, or 9,477 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2,144 tons, vlaued at $1,473,196; in 1906, 5,129 tons, valued at $3.900,000.

The output of the Crow's Nest Pass Coal Company's collieries for the week ending September 27th was 19,439 tons, a daily average of 3,240 tons.

Following are ore shipments and smelter receipts in south-eastern British Columbia districts for the week ending September 28th, and for the year to date, in tons:—

	Week.	Year.
Boundary	32,098	964,176
Rossland	5,521	199,801
East of Columbia River	2,899	103,182
Total	40,518	1,217,159

The Cobalt shipments for the month of September were:—

Name.	Cars.	Tons.
La Rose	6	150
Coniagas	3	95
Buffalo	5	150
O'Brien	2	61
Nova Scotia	1	30
Foster	3	95
Silver Queen	3	90
Nipissing	5	167
A. A. Cole (sample)	1	9
Total	29	847

The output of the four collieries of the Nova Scotia Steel & Coal Company for the month of September amounted to 49,053 tons, as compared with 54,928 tons in August. The amount of shipping, however, from the company's piers has by no means diminished, as every pound of coal banked was used to supply the increasing demand. The figures for the different mines last month were as follows:—

Mine.	Tons.
No. 1	21,950
No. 3	20,600
No. 4	400
No. 5	6,103

The output from the new No. 4 colliery is not yet being shipped, as the railway connecting the mine has not been ballasted. When trains begin running to the new mine modern mining machinery will be installed.

The output of the Crow's Nest Pass Coal Company's collieries for the week ending October 4th was 20,692 tons, a daily average of 3,448 tons.

The United States will produce in the current calendar year approximately 27,000,000 tons of all classes of pig iron, which will compare with 16,497,000 tons produced in the year 1904, and 18,000,000 tons produced in 1903. The production this year will represent an increase of nearly 65 per cent., as compared with 1904, the largest increase reported in any similar period in the history of the iron and steel industry.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
Antimony—10 1-4 to 12 cents per lb.
Arsenic, white—6 7-8 to 7 1-4 cents per lb.
Barytes, crude—$18 to $20 per short ton.
Bismuth, metal—$1.75 per lb.
Cadmium, metal—$1.50 per lb.
Carbons for drills—$70 to $80 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—25 to 40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$14 per short ton.
Flourspar, lump—$8 to $14 per long ton.
Graphite, domestic—$50 to $150 per ton.
Gypsum, lump—$7 per short ton.
Infusorial earth, ground—$20 to $45 per long ton.
Lead—4.75 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$50 to $80 per short ton.
Mica, scrap—$10 to $15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.
Nickel, metal—45 to 65 cents per lb.
Platinum, ordinary metal—$27.50 per ounce.
Platinum, scrap—$23 to $24 per ounce.
Pyrite—10 to 11 1-2 cents per unit for 38 to 45 per sulphur lump ore or fines.
Quicksilver—$40.50 per 75 lb. flask.
Sulphur—$19 to $23 per long ton.
Talc—$15 to $35 per short ton.
Tungsten, pure metal—$1.30 per lb.
Tungsten, ore, 60 per cent. pure—$9 per unit.
Tin—34 1-2 cents per lb.

MARKET NOTES.

Spelter.—Market has improved and displays strength. New York, 5.40 cents per lm.; London, £21.

Lead.—Production has been erstricted and lead holds its own at 4.75 cents per lb. New York; London, £19 5s for Spanish.

Tin.—Tin has declined markedly, and the market is weak. New York, 34 1-2 cents per lb.; London, £156 10s for spot.

Copper.—Copper is quiet. Consumers are still withholding orders. New York, lake 14 1-2 to 15 cents per lb.; eelctrolytic, 14 1-2; London, £61 15s for spot.

Silver.—Sept. 19th, 67 3-4; Sept. 20th, 67 5-8; Sept. 21st, 67 1-2; Sept. 23rd, 67 1-4; Sept. 24th, 67 1-4; Sept. 25th, 67 1-4; Sept. 26th, 67 3-8; Sept. 27th, 67 1-2; Sept. 28th, 67 3-8; Sept. 30th, 67 1-2; Oct. 1st, 66 7-8; Oct. 2nd, 66 3-4.

Mexican dollars, 51 7-8 cents; sterling exchange, $4.8575.

Pig Iron.—Pittsburg, Bessemer pig, $22.90; No. 2, foundry, $22.

Iron Ore.—Bessemer, old range, $5; Bessemer Mesabi, $4.75; non-Bessemer, old range, $4.30; silicious non-Bessemer, $2.50.

The output of gold in Rhodesia, South Africa, in August amounted to 54,749 fine ounces, against 50,127 last year.

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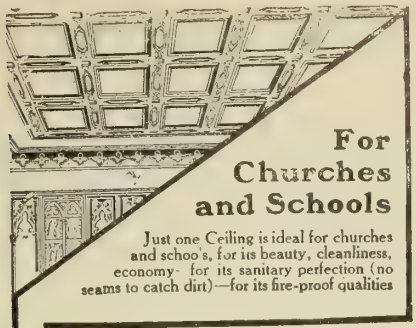
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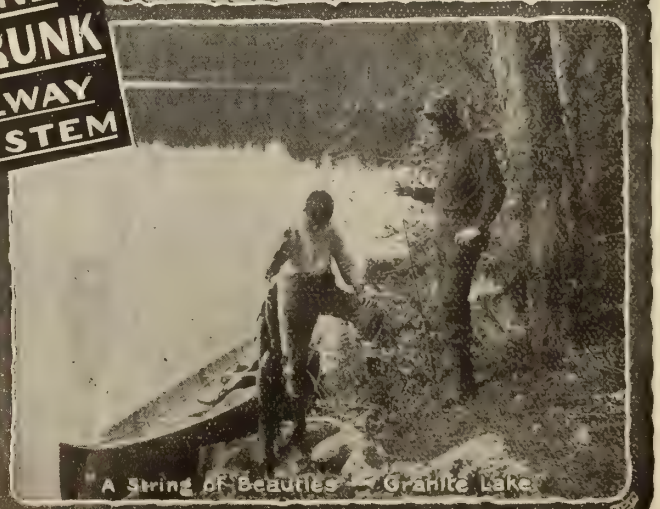
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The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

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The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the new Transcontinental Railway will run,

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The Bureau of Mines, at Quebec, will give all the information asked for in connection with the mines of the province, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to :

The Hon. Minister of Colonization, Mines and Fisheries,
Parliament Buildings, Quebec.

The Canadian Miner's Buying Directory.

SEE INDEX TO ADVERTISERS PAGE XXVIII.

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The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

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OL. I. No. 16 New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 18



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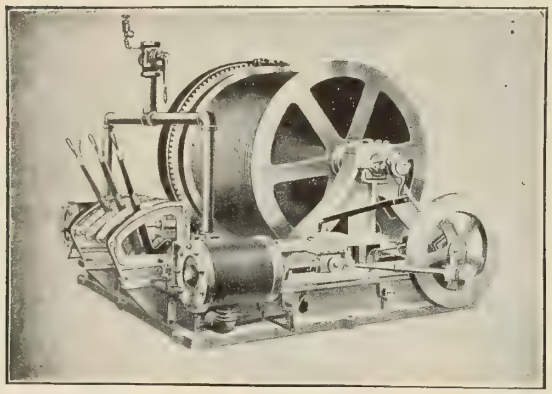
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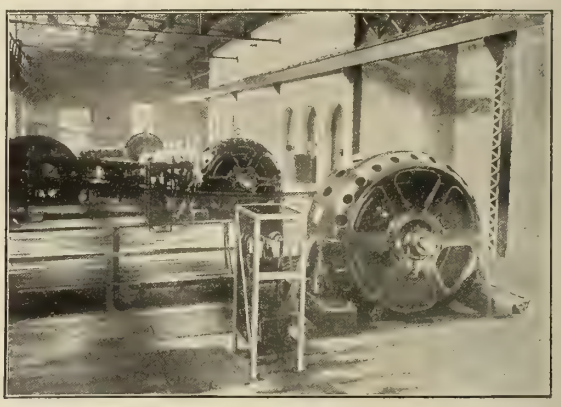
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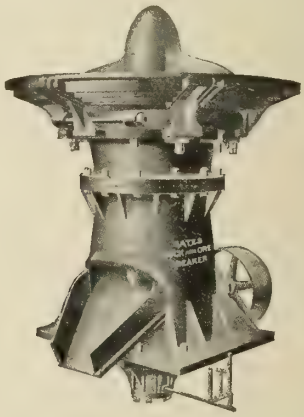
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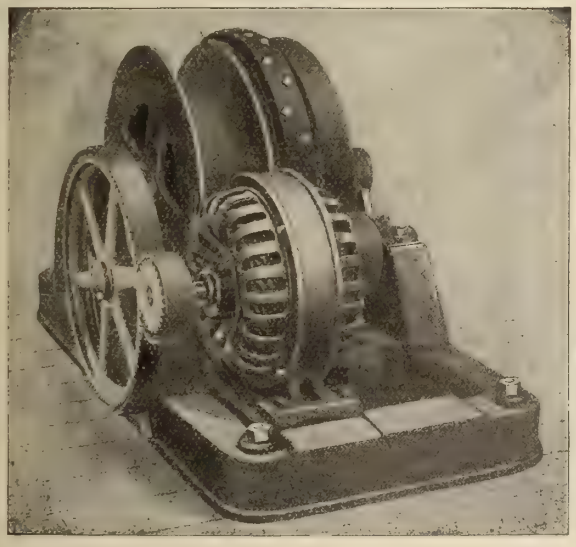
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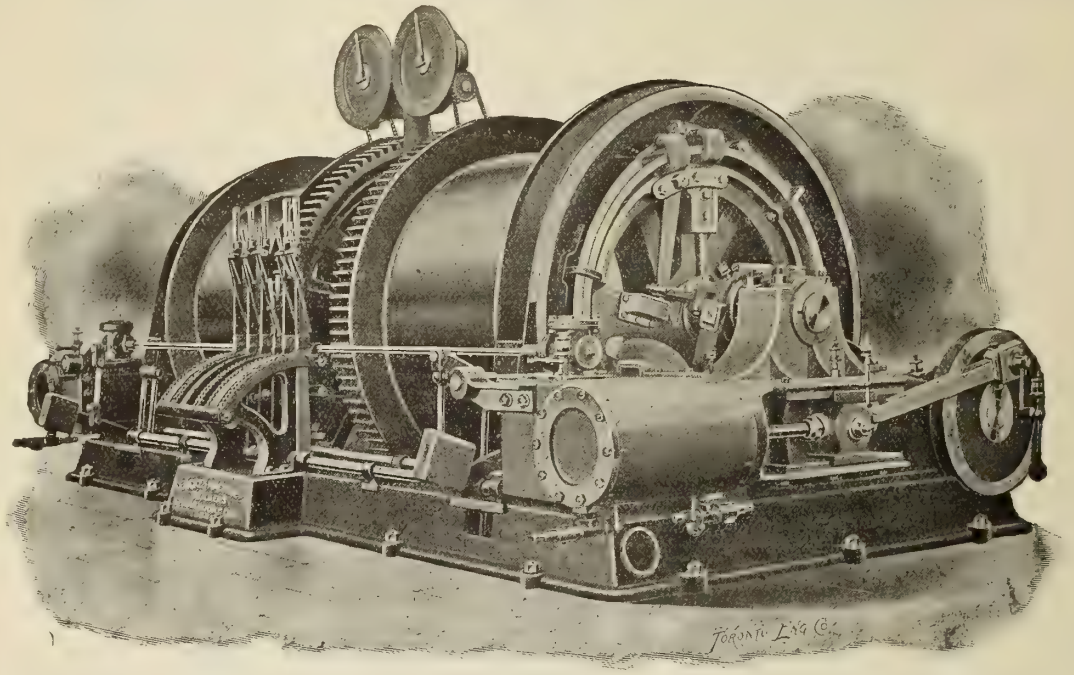
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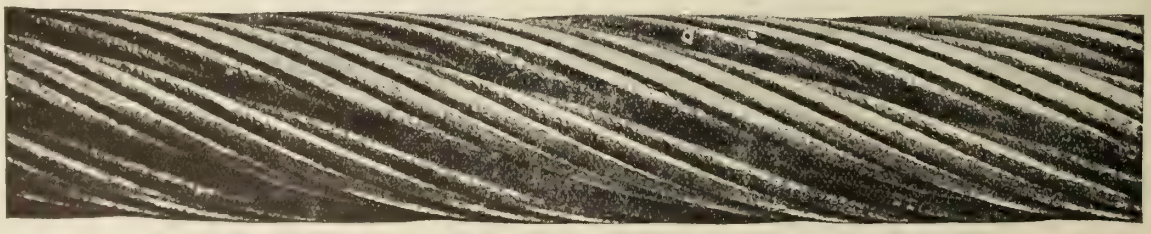


Illustration of **Winding Rope**, 240 fms. long x 3½ circ. Galvanized Special Improved Patent Steel. Compound Make, supplied to Kenneil Collieries, Bo'ness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

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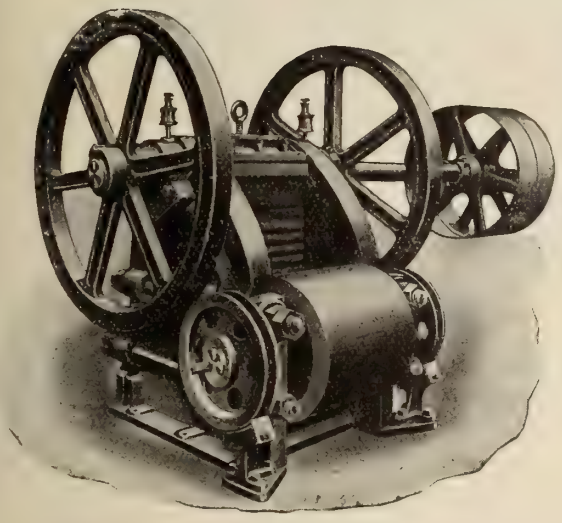
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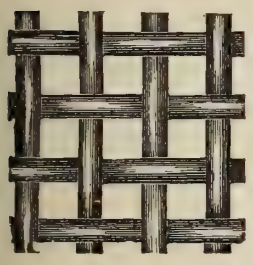
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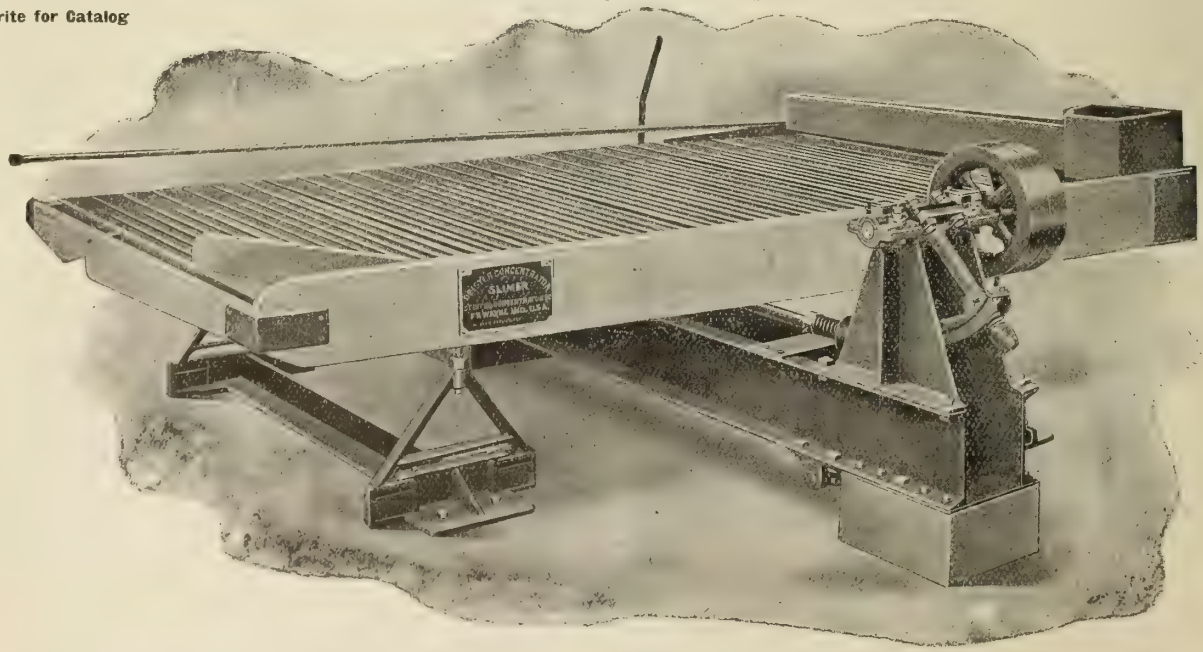
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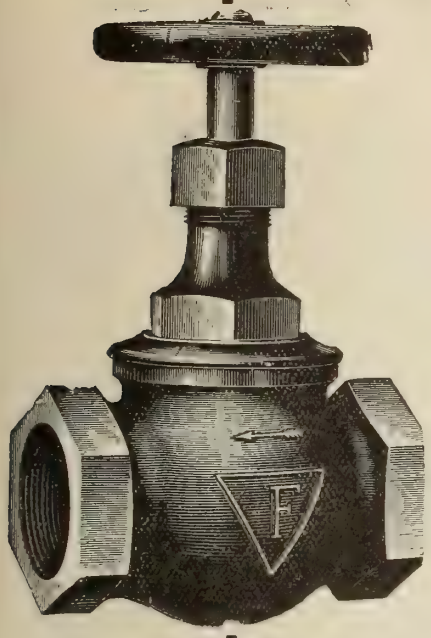
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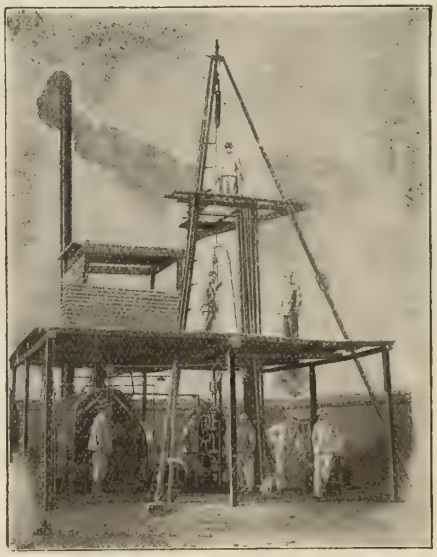
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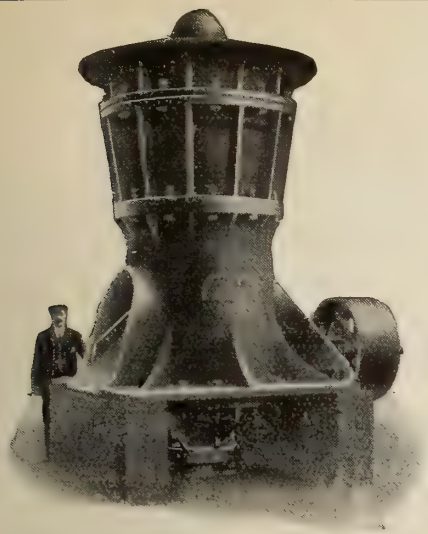
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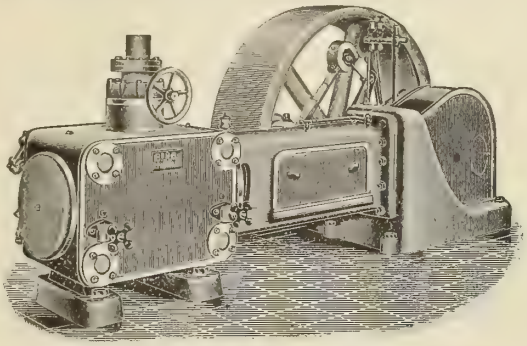
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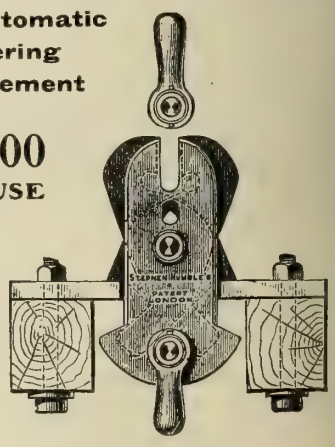
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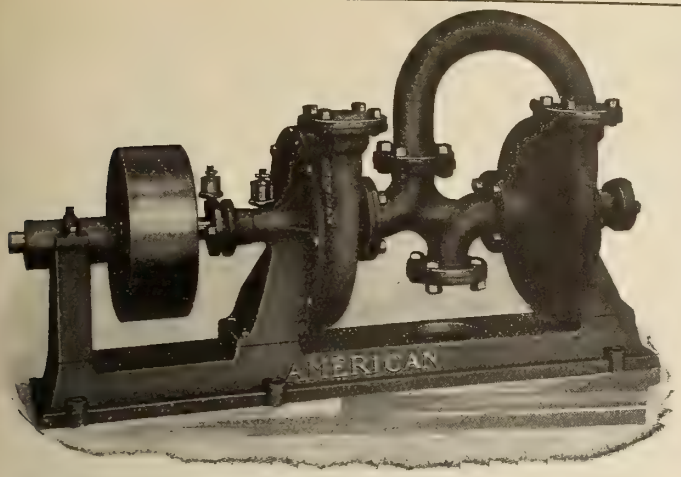
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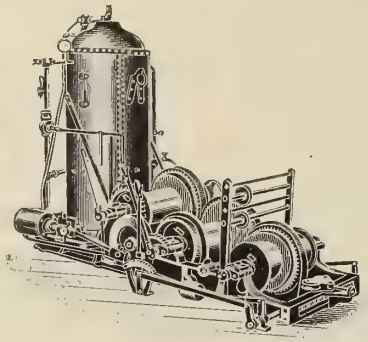
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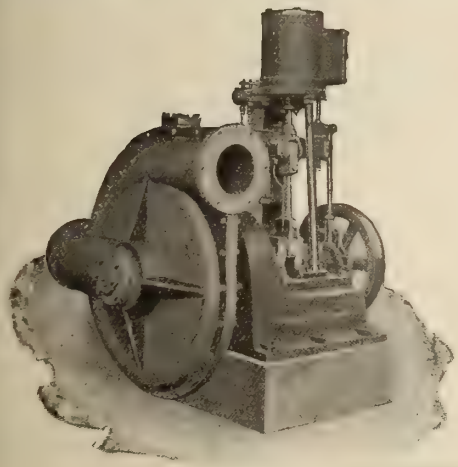
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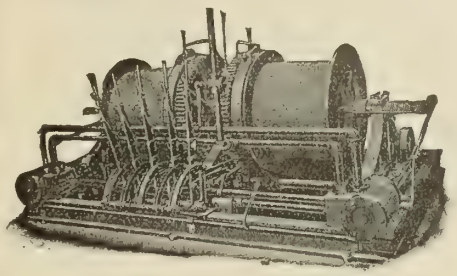
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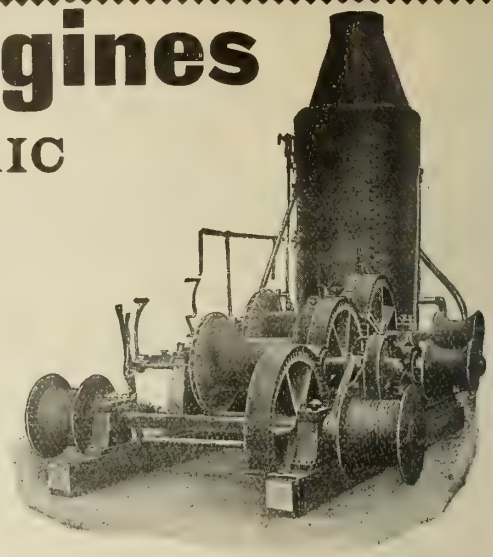
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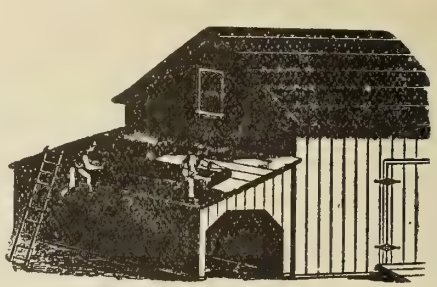
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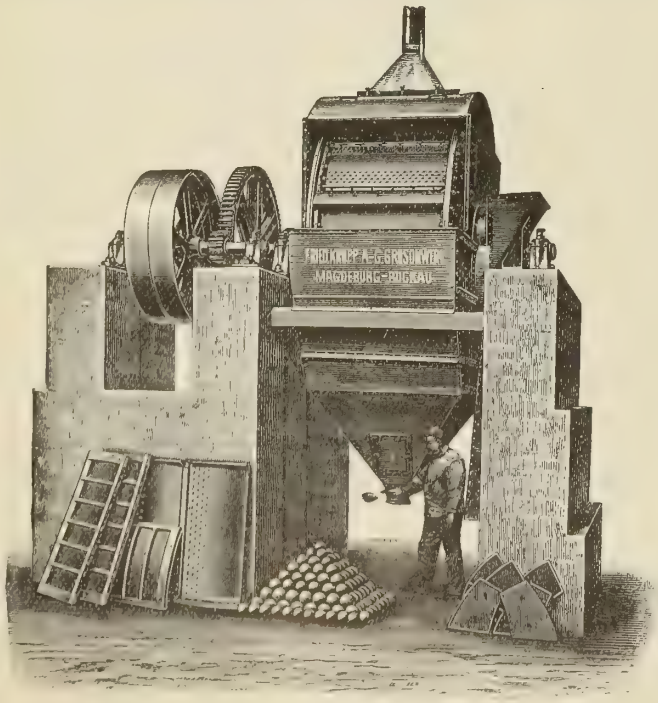
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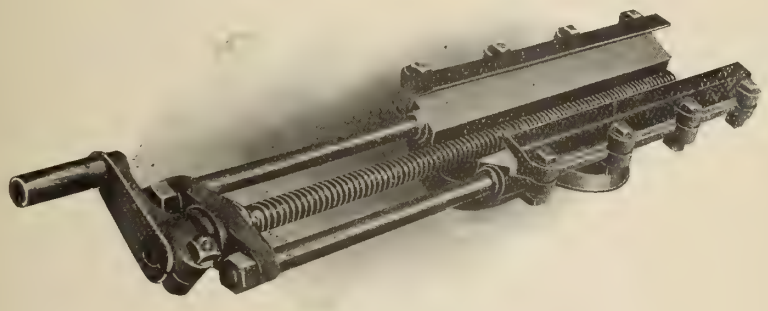
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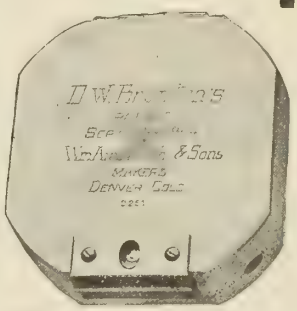
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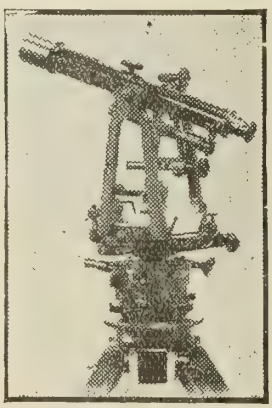
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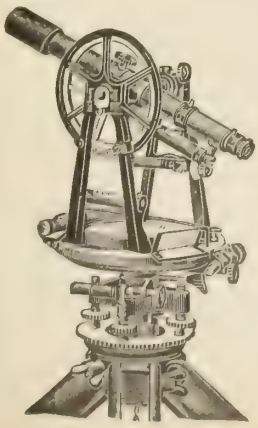
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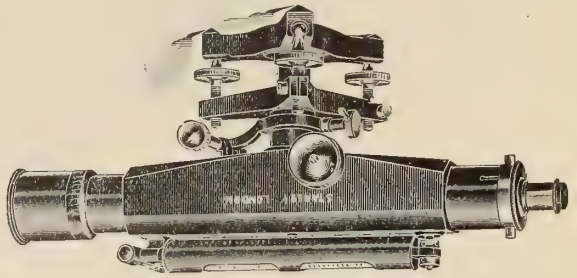
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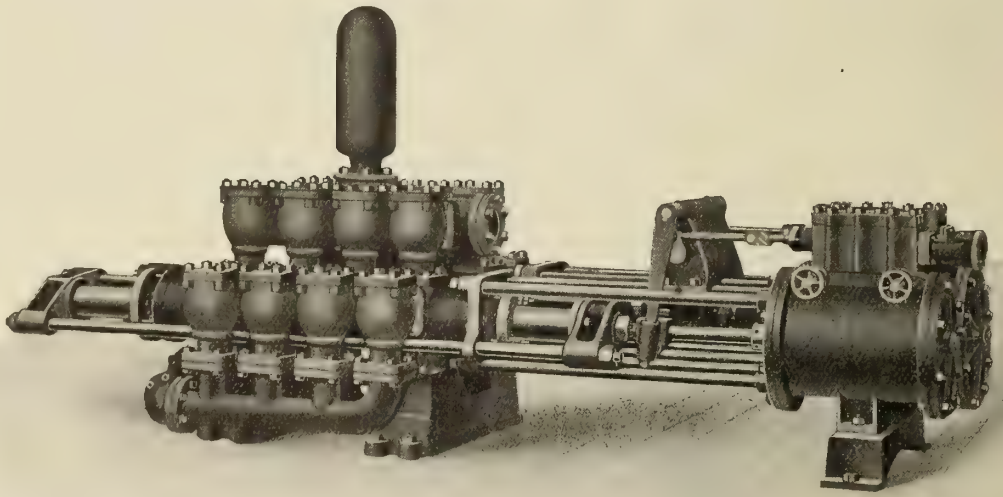
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THE CANADIAN MINING JOURNAL

THE OFFICIAL ORGAN OF THE CANADIAN MINING INSTITUTE

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J. C. MURRAY, B.A., B.Sc.

Associate Editor, H. MORTIMER-LAMB, Secy. C.M. Inst.
Business Manager - - - J. J. HARPELL, B.A.
Circulation Manager - - - A. P. DONNELLY, B.A.

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M. E., Nelson, B. C.; Frederick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron & Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

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OFFICIAL REPORTS.

The value of Government reports, more especially of reports having to do with mining, depends upon three qualities—timeliness, comprehensiveness and accuracy. Of these three virtues the first is not the least, and with it we have here to do. The Geological Survey of Canada, under the present Director, has issued its publications with most praisworthy promptitude. The British Columbian and Nova Scotian Governments have been not unreasonably tardy in presenting to the public their statements of mining operations for 1906. Alberta's pamphlet came late upon the scene. Quebec's has just appeared. Ontario's is yet to come.

We can see no reason why this carelessness should be allowed. If, as is probably the case, the officials who are responsible for the appearance of the annual reports are overworked, if their time is so broken up as to prevent their giving consecutive weeks of attention to these important publications, then more help is required and must not be withheld.

In each and all of the Provinces mentioned mining is an industry of major importance. The expense of engaging competent men to improve and supervise the Departmental publications would be a mere drop in the bucket of annual expenditure. Neither lack of funds nor any other plea of false economy can hold as an excuse for the negligence that permits an annual report to be more than six months late.

Of all the Provinces Ontario has more reason to need prompt official mining information and least reason to be subjected to irritating and harmful delays. The Province is rich. Her mines are contributing large sums to her treasury. If more help is needed it is easily available; if more help is not needed then there is no other valid excuse.

Last spring, acting on the information of the Ontario Bureau of Mines, a geologist visited, inspected and reported upon Larder Lake. His report is not yet published. Its prompt publication would have obviated a vast deal of robbery and dishonesty and would have done actual good. Good its belated appearance will do yet. But, meanwhile, the district, quite irrespective of its natural wealth or poverty, has been made the hatching ground of criminally fraudulent schemes—schemes carried out, we regret to say, by Toronto brokers. This plundering of the public should have and could have been stopped by the timely publication of an honest report.

There is indeed no valid reason why Departmental reports should be even six months late, and, with business-like methods, they could be published within three or four months of the close of the calendar year.

But since there necessarily is a certain amount of uncertaintiy as to the precise time at which a complete annual report can be made ready, we would recommend strongly the distribution of unbound interim reports and of bulletins. The bulletins issued by the United States Geological Survey and those distributed for a time by the Dominion Survey are of questionable value. They are primarily intended for immediate transcription by the press and may be incidentally useful. But we are of opinion that reports upon important mining districts should be completed, printed and distributed with all possible speed.

The Provincial reports of mining operations are all fairly comprehensive. The British Columbian report conveniently lists the mining companies. It is well illustrated and creditably put together. Ontario's reports usually include a treatise, written by a specialist, on some one branch of the mining industry. Generally speaking the Ontario reports contain a greater amount of geological information than can be found in any others. In geological maps also Ontario's volumes are far ahead of the rest of Canada.

Quebec and Nova Scotia, especially the former, issue reports that are, both in appearance and in contents, absurdly slim and inadequate. For this the Governments and not the heads of the respective Departments, must take the responsibility. We have no doubt that the Departments of Mines in both Provinces spend all available money on their reports. But when the annual records of a mining Province like Nova Scotia can be disposed of in a cheap paper bound pamphlet of a few score pages, accompanied by neither maps nor illustrations, there is something radically wrong. To a less degree this may also be said of Quebec. Quebec, more than any of her sister Provinces, needs a presentable, carefully edited annual mining report. Therefore she must assuredly make larger appropriations for this purpose.

In one sense it is true that the excellence of the official Departmental report on mining is a function of the progress of a country's mining industry. The importance, the absolute necessity of giving to the world year by year and, we would add, in some cases month by month, authentic official records of investigations, discoveries, exploration and progress cannot be gainsaid. Money spent in such work is bread cast upon the waters. But the bread must be cast at high tide.

IRON SMELTERS FOR TORONTO

An offer has been submitted to the City of Toronto by the Moose Mountain Mining Company. The company promises to erect large smelters on a part of Ashbridge marsh if the city will grant them the ownership of 350 acres. This is the only condition. No bonus is asked. The company, whose spokesman is Mr. D. D. Mann, of Mackenzie & Mann, has entire confidence in its ability to carry out its plan. The land asked for is worthless in its present condition—as its name implies. To redeem it, to lay foundations for large furnaces with a proposed aggregate capacity of 700 or 800 tons of pig iron per day, would occupy at least a year. Another eighteen or twenty-four months would elapse before the furnaces, stores, coke ovens, ore handling machinery could be put into working order. The prospect entails an expenditure of several million dollars for a plant to produce only pig iron. If steel is to be made larger sums will be necessary. Directly and indirectly the carrying out of this bold but perfectly practicable enterprise will mean the creation of a new industrial town within the city limits of Toronto and the employment of several thousand workmen.

The proposal has been enthusiastically received by the Toronto newspapers. Indeed it has met and will meet the approval of all thoughtful citizens.

Toronto will receive in exchange for a number of acres of marsh land an industry for which she would be justified in paying millions of dollars.

THE CANADIAN MINING INSTITUTE.

The Secretary of the Canadian Mining Institute returned recently to Montreal from an official visit to British Columbia. As will have been seen by the list published in our last issue, many new members were added to the membership of the Institute. Such visits are to be encouraged. We should see the Secretary more frequently in Ontario. Nova Scotia should also be regularly on the visiting list. An official viist, giving as it does an opportunity for personal explanations of the Institute's aims and objects, is more valuable than any number of typewritten communications. However, the Secretary deserves praise and commendation for the good results of his tour of the West. We hope that the time will soon come when the most important official of the Institute will be free to visit all parts of Canada once every six months. On this point we are to publish presently several communications.

BORROWED PLUMAGE

A subscriber has sent us a document that makes most painful reading. It is an appeal to Queen's University men to subscribe for the stock of the Combined Gold Fields, Limited. The letter is signed by Alfred Fitzpatrick, B.A., a graduate of Queen's. The stationery, as may be seen by referring to the half-tone reproduction on this page, is that of the Reading Camp Association. The names of prominent citizens appear thereon. Naturally these names have nothing to do with the Combined Gold Fields, Limited. Naturally, also, the average reader of the letter will be influenced by the fact that such names do appear.

Mr. John Sharp, late a lecturer in moral philosophy at Queen's University, is referred to as a director of the company and as general manager. Shares of a par value of $1 each are urged upon Queen's men at the price of

10 cents. The capitalization of the company is $3,000,000. It holds twenty-one mining claims in the Larder Lake mining district.

Some months ago, before the time had come for THE CANADIAN MINING JOURNAL to take a decided stand in these matters, there appeared in some of the Toronto newspapers a large advertisement over "Professor" John Sharp's name. The advertisement was as unbusiness-like and as remote from true mining as anything that

We do not know how the Reading Camp Association is organized. The names of its officers, however, show that it is a respectable missionary or educational enterprise. Mr. Fitzpatrick as Superintendent of Camp Education may be, no doubt is, a useful citizen.

But when Mr. Fitzpatrick prostitutes this enterprise, takes liberties with the official stationery and shamefully misuses the name of Queen's for his own pecuniary benefit, we have no hesitation in condemning

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The Reading Camp Association

Alfred Fitzpatrick, B.A.
Superintendent Camp Education

TELEPHONE 119

P.O. DRAWER 31

New Liskeard, Ontario Oct. 9, 1907.

Dear Friend,

On the opening of the Larder Lake Mining District Prof. John Sharp and I sent in prospectors who located a number of good properties.

We have organized the Combined Gold Fields Limited, with a capitalization of $3,000,000

This Company has 21 of our claims, each claim having about 40 acres. A discovery of mineral has been made on every claim. We have had the properties thoroughly examined by an independent expert mining engineer (Cambridge, Eng.), and his report is very encouraging

One large vein of quartz, from 20 feet to 30 feet in width. extending through the claims (80 acres), gives assays of from $3.90 to $10.60 per ton, the richness increasing with the depth. This claim alone promises to be rich enough to warrant an investment. We have good reason to expect that the venture will prove very profitable to all concerned.

You are no doubt aware that the richest mines of the world are low-grade propositions, in some cases their ores assaying not more than three to four dollars per ton.

It would give us much pleasure to have a large number of Queen's men associated with us as shareholders. Three of our seven directors are graduates of Queen's — Prof. John Sharp, Mr. James Hales and myself — and several other Queen's men are shareholders. Prof. Sharp is General Manager. His work so far has received very high commendation.

More money is urgently needed to sink shafts, procure stamp mills. etc., and we should like very much to have you become a shareholder and help carry on the work. You may rest assured that the directors will use every possible effort to make your investment profitable to you.

If you care to join us in this enterprise, you may have shares at 10 cents each. These shares are of the par value of $1.00 each.

Please send your application to Mr. James Hales, Traders' Bank Building, Toronto. You incur no personal liability beyond the amount of your subscription.

Yours sincerely,

A Fitzpatrick

Law & Company ever produced. But there was in it an element of almost pathetic simple-mindedness. We thought on reading it that here was a man, as ignorant of the ways of the world as he is of mining. We forebore from unkind speech.

However, the appearance of this circular has put "Professor" John Sharp, together with his associate, Mr. A. Fitzpatrick, in an unenviable position. The latter is obviously the chief sinner.

him without reservation or equivocation. Mr. Fitzpatrick as a graduate of Queen's is attempting to transmute into dollars and cents the University spirit. As superintendent of a praiseworthy educational scheme, he trades upon the standing of his employers in using their official stationery. And as an educated Canadian he should be heartily ashamed of himself.

It is a far cry from moral philosophy to gold mining in Larder Lake. "Professor" John Sharp appears to

have made the change with ease. But the transition seems to have robbed him of certain ethical concepts. Can Mr. Sharp think it a decent, an honest thing, for him to allow his name to be used in such a connection as this?

The circular contains not one important item of information regarding the claims. The "independent export mining engineer (Cambridge, Eng.)," and his "very encouraging report" is not information. It is simply the orthodox formula used by all wild-cats. The capitalization of $3,000,000 may be all intended for promotion stock. Nothing on this point is specified in the letter.

How deep has "Professor" Sharp sunk on his 20 foot vein that he is warranted in stating that the ore grows richer to the deep? What tests have been made and where?

The letter is singularly silent on all these essentials. On "Queen's" and on 10 cent stock it is strong.

If Mr. Sharp has a promising mine he does not need $3,000,000 to work it. If he had knowledge of the profession of mining and *faith in the mine* he would not ask for $3,000,000. He would be glad to get the few thousands necessary to erect a stamp mill and then depend upon his gold bricks for the rest. But, sad as it may seem, the methods of Mr. A. Fitzpatrick and "Professor" John Sharp are alarmingly like those of Law & Company. This in itself is full condemnation.

We need only add that we shall see to it that both Mr. Fitzpatrick and "Professor" John Sharp are not allowed to benefit by their astonishing indiscretion. Both of these gentlemen and all of their associates may count upon the disapproval of those who honor Queen's for what she is. Within her walls are no money-changers.

AN INSIDIOUS ASTERISK.

Among the exchanges coming to this office are many Canadian newspapers. In several of them we have noticed the glaring advertisement of Law & Company. Lately Law & Company have become more discreet. But in looking over a Nova Scotian newspaper, dated October 19th, our eye fell upon a paragraph, purporting to be a regular press despatch and not distinguishable from ordinary telegraphic news, save by one mark—a small asterisk at the end. Looking up the column we noticed the advertisement of a corn cure with the same mark, and throughout the paper the advertising paragraphs were similarly marked.

The paragraph in question is dated from New Liskeard. It narrates vividly the enthusiasm of a Mr. F. W. Rosser after he had inspected the Highland Mary claims. It speaks of a slab of gold quartz "valued at over $15,000 in gold to the ton."

When the promoters of a mine descend (although it were a difficult feat for Law & Company to descend at all) to patent medicine methods of advertising, fake is writ large on their enterprise.

Let us again remind the public that the owners of rich mines do not advertise. The appearance of such announcements as Law & Company's are most cogent proofs of their own lack of confidence in their alleged mines.

PEACE.

The strike of the employees of the Cumberland Coal & Railway Company at Springhill has ended. A conference between the miners and Government officials, held in Halifax at the suggestion of Premier Murray, appears to have had the happy effect of clearing up much misunderstanding. The miners decided to accept the Board of Arbitration's finding. Work is to be resumed.

While we are heartily glad that the strike is ended, we must express the opinion that unless peace is to be lasting and unless the public can be assured that hereafter the awards of the Board of Arbitration will be accepted without question, no material gain will have been made.

There is something radically wrong when workmen go out on strike so frequently as has been the case at Springhill. It is not possible that the men are altogether to blame. Nor is it expedient to attempt to analyze the history of successive troubles and apportion out the responsibility for the friction. Let the past take care of itself. For the future it must be demanded that both employers and employees avoid the very appearance of evil. Springhill has not a proud record. It will take many years of harmony and good-will to compensate for her long period of costly strife.

RESEARCH

The newly appointed Professor of Chemistry at McMaster University, Dr. J. Bishop Tingle, in an inaugural address hinted that the best investment for Cobalt mine owners would be the establishment of a laboratory of research for students of metallurgy and chemistry. This is a vitally practical point, and Professor Tingle did well in impressing it upon his hearers. Not in Cobalt alone, but over the whole length and breadth of all the mining Provinces of Canada, there are problems awaiting the trained young Canadian scientist. Some of our coal mines present a series of intricate questions in the preparation of their product for the market—the elimination of slate, sulphur and other impurities by washing, the utilization of slack and culm are examples of there. The concentration of our vast bodies of low grade iron ores is another wonderful field for investigation.

Apart from the ores of the precious metals, in the reduction and treatment of which peculiar difficulties are met in every mining camp, there is room for a great deal of pioneer work in connection with the ores of the base metals and the non-metallic minerals.

A technical college that systematically encourages the pursuit of practical and useful subjects is not merely utilitarian. It is living up to the highest ideal of life, inasmuch as it is attempting to fulfil its true purpose.

THE HENDERSON TALC MINE.

In the report of the Bureau of Mines for 1899 mention is made of the discovery of a deposit of excellent talc in the vicinity of Madoc, and the opening of a mine, the product of which was shipped to New York. The hope is then expressed "that Canadian capital will be found to operate the mine and prepare the product for market at home. This latter is yet an unfulfilled desire. In the summary of mineral production of Ontario for 1899 the talc mined is set at 100 short tons, valued at $500.

In the succeeding year the mine is reported as having attained a depth of 53 feet. The width of the deposit of merchantable talc is put at 34 feet. The quantity raised at the two above mentioned mines during 1903 is fixed at 920 tons, worth $2,625.

One thousand three hundred and thirteen tons, valued at $2,919, was the quantity produced by Ontario in 1904. Apparently all of it came from the Henderson Mine. The year 1905 saw about the same quantiy mined, and in 1906 1,234 tons, worth $3,030. The output for 1907



TALC STOCK PILE.—HENDERSON MINE.

The report of the Bureau for 1900 mentions the discovery again, and dwells upon its importance and upon the purity of the talc. The shaft was then 43 feet deep, with a cross section of 18 by 20 feet. The output for 1900 was 1,000 short tons, valued at $5,000.

In 1901 the Henderson Mine (that name still clings to it) was idle; but talc was shipped from the dump to the quantity of 400 tons.

During 1902 the Henderson Mine and another talc mine near Gananoque produced together 697 tons, valued at $930.

will total about 1,500 tons. The values per ton heretofore assigned are much below the actual price obtained for the talc.

The Henderson talc mine was discovered eight years ago by James E. Harrison, of Madoc. It is a quarter of a mile from the north shore of Moira Lake, and a mile and a half southeast from the Town of Madoc. Moira Lake, as beautiful a sheet of water as one could wish, stretches nine miles east and west, with an almost uniform width of a mile.



View of Shaft Mouth.



View of Shaft Mouth.

The mine on lot 14, concession XIV. of Huntingdon Township, Hastings County. It is operated under lease by Messrs. S. Wellington and William Cross, of Madoc. Mining is conducted for only three or four months of the year and the talc is consigned in lots of five or ten car loads to New York. The demand is limited to a maximum of 1,500 tons per annum. The present capacity of the mine is easily 60 tons per day. But since work is not continuous, time and money are wasted in unwatering and cleaning the shaft each season.

The working equipment consists of a stationary boiler and a steam hoist, by which two half ton buckets are operated. Drilling is done by hand, a 1 1-2 inch ratchet auger being used. The shaft is entirely in clean talc and blasting and breaking are easy.

The shaft is 105 feet deep. It bottoms in clean granular massive talc. Neither hanging nor foot wall is visible to the deep, where the shaft is 25 feet wide by 30 feet on the strike.

It was the intention of a previous operator to start drifting at a depth of 60 feet, and stations were started. But trouble ensued and the present lessees found it necessary to widen and clean out the shaft and carry it to its present depth before drifting could be begun safely.

The shaft or pit, as it is more properly, now opens about 40 feet by 35 feet at the mouth and narrows down



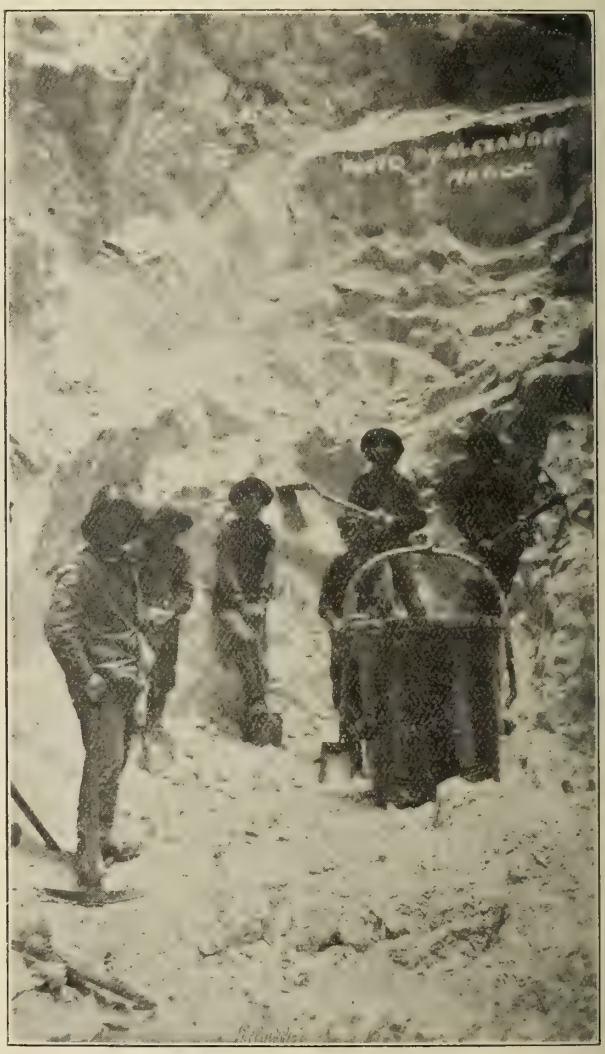
Stock Pile, Derrick and Power House.

irregularly to the bottom measurements mentioned before. Drifting is to be commenced next summer and the deposit will be proved to a very considerable extent. The maximum width of the vein is about 36 feet. This measurement is obtainable near the surface, where, in the pit, the walls are visible. The strike is north 40 degrees west. The talc vein cuts across a tilted deposit of dolomitic limestone. The dip is 80 degrees south.

Three hundred feet to the northwest a large outcrop of the vein is visible. Hence the probabilities are in favor of the deposit being large enough to meet an increased demand for some years to come. It is the intention of the operators to win their supply of talc in future by drifting to the strike. This will of course develop the property to the best advantage.

The stock pile, containing between 400 and 500 tons of this gleaming white mineral, was a remarkable sight at the time of the writer's visit. The massive talc shows not a tinge of extraneous coloring matter. No impurities are visible. There are occasional inclusions of leek-green serpentine, which, however, powders pure white and is not culled from the shipments.

The United States production of talc and soapstone during 1906 amounts to 120,644 short tons, valued at $1,431,556. The average value per ton derived from these statistics is not reliable. The many grades of material mined and the conditions of production influenced the price in different localities. But throughout the United States there was during 1906 a marked falling off in the supply of the purer grade of talc, such as is mined at Madoc. Fibrous talc, included in the returns specified above, was mined to the extent of 64,200 short tons, valued at $541,600 or $8.43 per ton. The uses of fibrous talc are much less numerous than those of the white granular massive variety. Moreover, fibrous talc, of which the State of New York is the principal producer, is intrinsically less valuable. The Canadian product is sold at a high price in New York. The exact figure we are not at liberty to quote. But the market is limited and close. Hence production must be cur-



Bottom of Shaft—Henderson Talc Mine.

tailed to a specified amount. There is no doubt that in an open market the Madoc talc would bring a much higher figure.

The process of preparing the crude talc for manufacture is cheap and simple. A little scent, an ingenious tin box and a reproduction of the features of an enterprising druggist convert the dried and milled talc into a relatively costly toilet powder, on the sale of which enormous profits are realized.

There is room here in Canada for the manufacture of many articles now imported from other countries, principally from the United States. A mill for grinding and preparing the talc would cost but a few thousand dol-

lars and might readily be the basis of many flourishing industries.

To illustrate this a few of the uses of prepared talc may be cited. Powdered or flour talc is used in the manufacture of electric insulators, steam pipe insulators, foundry facings, fireproof paints, "dope" for dynamite, paper, toilet powder, lubricators, etc., etc. It also plays an important part in the manufacture of leather goods and of soap. Other uses to which powdered talc is put we shall not describe beyond mentioning that the mineral is made to play the part of an adulterant in certain foodstuffs. But sinful man and not the useful mineral must be blamed for this.

Hearthstones, furnace linings, laboratory tables, laundry tubs, gas tips, pencils and an almost infinite number of lesser articles are manufactured from the massive unground steatite.

The operators of the Henderson Mine, Messrs. Wellington & Cross, are members of the Madoc Mining Association. The president is Mr. W. A. Hungerford and the secretary is Mr. R. T. Gray. Mr. A. W. Coe is first vice-president and Mr. Wellington second vice-president. The Association meets fortnightly in the Board of Trade rooms. Here opinions are exchanged and mining matters are discussed. The organization, which is closely affiliated to the Board of Trade, is informed with the spirit of mutual helpfulness. The members realize that their district needs not booming, but steady, careful attention. There are no capitalists in this handful of mining men. But there are self-reliant, strong men of high courage, who intend to win and who have a large faith in the mining possibilities of Hastings County.

Madoc is a bright, well-paved thriving country town. A visitor's first impression (and his last) is one of substantial prosperity and intelligent progressiveness.



BOTTOM OF SHAFT—105 FEET—HENDERSON TALC MINE.

DIFFERENCE OF THREE CIPHERS.

ALEXANDER GRAY.

That the Witwatersrand gold fields are the ultima thule of concentrated riches was long since conceded by unprejudiced mining authorities. But when Mr. J. B. Robinson, the wealthiest of the coterie of magnates, identified alike with the Kimberley diamond mines and these Witwatersrand "banket" beds, proclaimed in London recently, that gold worth $5,000,000,000,000 remained these, he blew out the boiler plates, wrecked all previous conceptions of what part the forty miles of so-called Main Reef Series are to play in this century's monetary affairs, and "pied" the calculating machines of distinguished international experts. Next day Mr. Robinson hastened to revise his "copy," ran the blue pencil through three superfluous ciphers, and the concrete fact remains that this millionaire mine owner expects a gold-getting record of $5,000,000,000 before the mills of the Rand are dismantled and the last retorted metal poured. Thus the strain upon the credibility of scientists was relieved. A slip of three ciphers bridged the chasm between the possible and the grossly hypothetical. Another five billions in ingots will suffice to firmly establish the Witwatersrand in the same class as the Standard Oil and United States Steel trusts; and it is not at all surprising that Mr. Robinson became so entangled in ciphers he inadvertently took the limit off popular credulity. Had the Robinson figures been reaffirmed they would have overwhelmed those of Hamilton Smith, Hammond, Jennings, Legget, Hatch, and others less roseate, though all sufficient. Five billions in sight make the life of the Witwatersrand 33 years in-

stead of 3,333, as Mr. Robinson first noted, accepting the current rate of production as the average, and in any event a third of a century may reveal other sources of gold supply.

Mr. Robinson, having returned from South Africa, no doubt seeks to dispel the gloom encircling that "most distressful country," a gloom which holders of "Kaffir" scrip find ruinously expensive. His arrival during a period approaching panic was inopportune, but there is consolation in the gentleman's change of front, because it is not so long ago that he advised the voluntary liquidation of his Robinson South African Banking Company owing to the inadequacy of general business in South Africa. There were too many banks. Now there is business in abundance and no blanks. Every package contains a prize. Such are the uses of adversity. Reaction and reagents have evolved phenomenal optimism out of a decade of despair. So it is in order to realize on expectations and induce financiers to forget all the writings off revealed in balance sheets with distressing regularity.

Besides the five billions, "there are immense deposits of gold, gems and minerals as yet untapped in the Transvaal," said Mr. Robinson. Before proceeding to determine the factor of the payability of these, from the Limpopo to the Vaal Rivers and Bechuanaland to the Portuguese border, investors expect the Botha Ministry and the magnates to give them something more substantial than glowing prospectuses. Underwriting syndicates have had too many cold douches to venture further afield, and while the Witwatersrand has prestige to which it is properly entitled, there will be no rush of fresh funds until greater concert prevails between the Botha Ministry and the masters of the mining industry. Conceding the point that there is no longer danger of South Africa's "exhaustion," as has been argued by the advocates of restricted energy, Mr. Robinson emerges from his voluntary retirement and unfolds a treasure-laden vista extending to mid-century. In the interim there will be racial amalgamations and political readjustments. Should there be profitable by-products in the "immense deposits yet untapped," new groups will continue the labors begun by Rhodes, Beit, Wernher and Robinson, without intermission, perhaps with less friction.

A steady supply of yellow metal is what money markets and the arts will heartily welcome. Unfortunately Mr. Robinson's optimistic horoscope is overshadowed by economic influences decidedly adverse to expansion. Mr. Robinson cannot obscure these. He has publicly proclaimed them. His Landfontein and Langlaagte estates have potentialities awaiting demonstration. Large areas controlled by him lie fallow. Unskilled labor and high wages due to living charges are disconcerting and deterring elements. There may be $5,000,000,000 worth of gold, but most of it is in solution—the solution of the labor and living problems. The Main Reef Leader and South Reef are the profit earners. The likelihood of mining and milling large quantities of the Main Reef itself hardly is inducement to investors, until there are revolutionary reductions throughout South Africa's economic system. According to the cables, Mr. Robinson is left to infer that the 4 and 5 dwt. rock of the Main Reef will show a profit. It might, if the proposition was a free milling one, and mining, crushing and extraction were as cheap as they are in some other countries. Neither of these essentials is in effect at the Rand. The feeding of mills from great depths is a serious item in the costs sheet. Mr. Robinson is aware of this. Low grade ore, heavy capital outlays, dear labor, never yet facilitated the payment of dividends—and they never will. Mr. Rudd, who was associated with Mr. Rhodes in the De Beers amalgamation, and in the original exploitation of the Witwatersrand gold fields, put the case plainly when he gave the cost of bringing a deep level mine to the producing stage at a round million sterling. That there is a larger tonnage of low grade ore in the Main Reef itself than has been raised from the Main Reef Leader and the South Reef, is known, but with working costs at a sovereign, on the average, disappointed shareholders will hardly risk a favorable selling opportunity rather than await the attainment of the datum line of 15s.—working costs as decreed by Mr. Ross Browne, acting in behalf of Messrs. Wernher, Beit & Company. In that he would revive interest in the Witwatersrand Mr. Robinson has chosen the better part. To accomplish that object is going to take more time than talk.

COMPOSITION OF GLASS SANDS AND MOULDING SANDS.

A high degree of purity is required for glass sand. Its preparation, when it is not sufficiently pure, is a matter of comparatively great expense. All argillaceous material must be washed out. Massachusetts sands of exceptional purity bring $4.50 per ton after special preparation. Prices of sands in other localities range from 60 cents to $1.50 per ton.

Moulding sand, used in making moulds and cores for casting iron, steel, brass and other metals, varies from clayey loam to a clean, sharp, coarse sand, according to requirements. There are a great variety of sands used. Often loam, clay, oil, flour or molasses are mixed in definite proportions. The essential qualities are refractoriness, porosity and bond. The size of grain affects directly the porosity of the material. The finer and more intricate the design the finer the sand required. Too much clay and iron oxide will cause the mould to shrink and crack under the intense heat; too little will cause it to dry and crumble or collapse entirely. A good sand should show to the unaided eye grains nearly uniform in size, angular rather than round, and when spread on paper it should show no dust. To the touch the sand should feel sharp, and when moistened with water it must be capable of being formed into coherent balls. The following tables displays the composition of American glass sands and moulding sands:—

	Silica.	Alumina.	Iron oxide.	Lime.	Magnesia.
2	99.659	0.310	0.11	0.020	
2	98.87	0.21	0.08	0.24	0.12
3	97.50	1.50	0.50	....	0.50
4	81.50	9.88	3.14	1.04	0.65
5	84.86	7.03	2.18	0.62	0.98
6	82.92	8.21	2.90	0.62	....

1. Sand for clear flint glass—white, medium grain.
2. Sand for window glass—gray, medium grain.
3. Sand for green bottle glass—pale yellow, medium grain.
4. Sand for delicate moulding—fine grain.
5. Sand for medium class moulding—medium grain.
6. Sand for heavy castings—coarse grain.

President Plummer of the Dominion Iron & Steel Company is in England. He will return to Canada during the early part of December.

THE BRITISH WORKMEN'S COMPENSATION ACT, 1906.

THE LIABILITY OF MINING COMPANIES.

(Contributed)

The British Workmen's Compensation Act of 1906, which came into operation on the 1st of July, 1907, is a much more radical piece of legislation than the Act of 1897 or the Act of 1900, which were themselves perhaps as radical measures as were ever passed by a Conservative Government in the British House of Commons. The Act of 1906 extends the benefits of the Act of 1897 to almost all classes of the working population, including all domestic servants, clerks, corporation employees, and the servants of the Crown, outside the naval and military forces.

These notes will, however, be confined to considering the influence of the new legislation on the liability of mining companies, upon whom, it can be very properly asserted, the Compensation Act imposes a more onerous burden than upon any other class of employes.

In the Act of 1897 the compensation to be paid in case of disability is half the average weekly wage of the injured person throughout the whole period of disability, less the first two weeks, and in cases of death by accident a sum of not less than £150 and not more than £300, this sum being based on the average earnings of the deceased during the three years immediately preceding his accidental death.

To colliery operators probably the most important alteration to the Act of 1897 is the provisions of Chap. I., clause 2 (a), which reads: "The employer shall not be liable under this Act in respect of any injury which does not disable the workman for a period of at least *one week* from earning full wages at the work at which he was employed." In the Act of 1897 the corresponding period was two weeks.

It is the experience of all mine employers that by far the greater percentage of accidents are minor accidents, involving from a few days' to a few weeks' disability. The immune period of two weeks under the Act relieved the mine owner of liability for most of these small accidents without any hardship to the miner. The shortening of the immune period to one week puts a premium on idleness and malingering, and will impose an almost intolerable burden on the mine owner. Friendly societies and sick benefit societies flourish immensely amongst the miners of the British Isles, and it is not by any means an unusual thing for a miner to be in two friendly societies, in addition to the colliery relief fund. Suppose he is so injured as to be laid off for a month. He will receive at least $4 per week from each society, $2 from the relief fund, and half his average wage from the colliery office under the Compensation Act, say $5. This will give him a weekly income of about $15, considerably more than he would earn by working. Under these circumstances it is easily understood how difficult it is to effect a cure. The Act provides that prompt notice shall be given of any accident received, however slight, but it does not provide any penalty for non-compliance with this provision, nor does failure to report an accident invalidate a claim for compensation. It is very difficult in some cases to say whether the injury complained of was received when at work or not, particularly in the case of internal strains and sprains, or say a poisoned thumb, which may easily have arisen from causes entirely outside of a man's employment. Where a man has alleged injuries, and is drawing his "compensation," there is nothing to prevent his taking a holiday at the seaside at his master's expense, and this is indeed very often done. If in such a case the weather at the seaside is fine, and the $15 per week mentioned before is forthcoming, it may take quite a number of doctors to work a cure.

The temptation to malingering which is occasioned by the provisions of the Compensation Act is bearing very hardly on the old established colliery relief funds, and on the friendly societies, the calls upon which have considerably increased since the passing of the Act, for a very obvious reason. The colliery relief funds were supported by voluntary subscriptions from the men collected through the pay rolls, augmented by grants from the colliery companies and landlords. Most of these relief funds have had the handling of large public subscriptions collected after the great explosions that have marked the history of British coal mining. They have done a notable work in the past, but now that the chief reason for their existence is removed by the provisions of the Compensation Act, they will in all probability decline and gradually be wound up. It is very obvious that the subscriptions of the colliery owners will cease.

The cost of compensating those permanently injured is now much larger than it was when the Act was first passed, because the number of persons permanently injured is cumulative, and the full burden of this class of compensation has not yet been felt.

Much hard feeling has been caused by the dismissal of aged workmen about the mines, but it cannot be said that the mine owners had any choice in this matter. When a man passes a certain age even a slight injury may prove a permanent disability when added to the decay of advanced years. We have known colliers hale and hearty at 65 and 70 who began work below ground at the tender age of seven years, but no employer could afford to retain workmen of this age, and run the risk of their becoming permanent pensioners on his pay roll. Formerly these men were employed as watchmen, axle greasers, etc., and in light work suited to their powers, but now one can find very few men around the English mines who are over sixty.

The most difficult cases to regulate in the permanent disablement class are those alleged to arise from internal strains. When such cases have been compounded for a lump sum there have been some rather miraculous cures. In a case recently reported in the *Colliery Guardian* it is stated that a man died in hospital from the result of an alleged strain received at work, but the post-mortem proved that he had really died from Addison's disease. Such cases are peculiarly difficult when the man is over 50 years.

A difficult feature is that in many or in most cases the examining and certifying doctor is the colliery medical officer, who is indirectly the servant of the workmen. He naturally does not wish to displease them, and is often placed in a difficult position. Generally, where a doubt exists the workman will get the benefit of it. The new law provides for the appointment of medical referees to be chosen by the State, who shall not be in private practice. How this will work out it is as yet too early to form an opinion. Political wire-pulling will without doubt have a good deal to do with the appointment of these officers. A prominent miner's leader the other day

referred to these gentlemen as "detective doctors," and appeared to very much resent their appointment.

The death claims payable under the Act are perhaps the least onerous. Chap. I., clause c, runs as follows:—"If it is proved that the injury to a workman is attributable to the serious and wilful misconduct of that workman, any compensation claimed in respect of the injury shall, *unless the injury results in death or serious disablement,* be disallowed." The words italicized are new in the Act of 1906, and it would appear that all deaths by accident at work come under the provisions of the Act as to compensation, even when due to serious and wilful misconduct. In a case recently tried before an English Court it was shown that a workman who had been killed by a blast in the mine had apparently committed deliberate suicide. His fellow-worker testified that his manner had been depressed, and that while he could not suggest that the man had committed suicide, he did not think the death was accidental. The judge held that such a death would be repellent even to a man who contemplated suicide, and awarded compensation to the extent of £120 to the deceased's widow, who had not for some time been living with her husband.

Since the passing of the 1897 Act there has fortunately not been any colliery explosion in the British Isles attended with any great loss of life. The safety lamp and the application of scientific research to mining have rendered the modern mine a comparatively safe place, apart from the constant accidents from falls of roof and side. We hope the days of such catastrophes as the Old Oaks, Lundhill, Swaithe Main and other memorable explosions in England are gone forever, but the Courrières disaster was a hideous reminder that such things may again occur. Under the Compensation Act the mine operator is liable for such large payments in a case of this sort that it would in all probability mean bankruptcy for even the wealthiest companies when added to loss of output and damage to property. Under the provisions of the Act of 1906 the claims of dependents of injured or deceased workmen are preferential under the Bankruptcy Act, and have a first claim on the assets of the company involved.

It will thus be seen that the Workmen's Compensation Act of 1906 is likely to become an "Old Man of the Sea" on the shoulders of the coal mining industry in Great Britain. It is moreover, a distinctly unfair burden, for it bears on the colliery operator alone, whose position of late has not been a happy one. The owner of the coal bears no part of the expenditure. His royalty cheques must be paid, come what may, but the colliery operator has to face a yearly increase of municipal and county taxation, higher wages, higher freight charges, increased cost of material, the Compensation Act, and over all increased foreign competition, unhampered by socialistic legislation.

It is not at all unlikely that legislation of a similar character may become a live question in Canadian politics very shortly. Drafts of bills based on the British



BRITISH JOURNALISTS AT COBALT TOWNSITE MINE.

Workmen's Compensation Act of 1906 have been presented in several of the Provincial Legislatures. Such being the case, it may be timely to endeavor to forecast the probable cost of such a measure to Canadian coal operators. There are no accurate figures available by which a calculation could be made from Canadian data, as no record has ever been attempted of other than very serious and fatal accidents. We must therefore use English data very largely in attempting to forecast what this probable cost would be were such legislation to go into effect in the Dominion.

Mr. Markham, the miners' representative for South Wales, stated in the British House of Commons when the "fortnight clause" was under discussion that the cost of the 1897 Act in South Wales had been 1½d. or 3 cents per ton, and from other calculations we have made this figure is about correct. Taking the annual coal production of Canada at 10,000,000 tons, a mark that will very soon be attained, will give a cost to the operators of $300,000 annually, more than half of which would be borne by the coal operators of the Province of Nova Scotia alone. In this Province the cost of the relief societies at the collieries averages from .8 cents to 1 cent per ton, and the relief paid is from $3 to $3.50 per week, which is about half of what would have to be paid under a Workmen's Compensation Act. Doubling this cost per ton, therefore, on 10,000,000 tons, we get a figure of $200,000, but one must consider that the death claims paid under the British Act are from $750 to $1,500, as compared with from $60 to $100 by the relief socities. If the tons raised per man killed are taken at 200,000 tons, we have 10,000,000 divided by 200,000 equals 50. As very few miners in Canada earn less than $500 per annum, we take the figure of $1,500 death compensation which gives $75,000, making a total in this second calculation of $275,000. But it is difficult to figure what the payments under a Workmen's Compensation Act would be from relief societies data, for under the constitution of these same societies malingering is reduced to a minimum, because the members watch one another, whereas under a Compensation Act, the incentive to do this is removed. The *Colliery Guardian* for 11th May, 1906, quoted in an editorial on the subject of malingering from a circular issued by the South Wales Coal Owners the following significant figures:—

Employees injury and compensated per 1,000—

1899	26 per 1,000
1900	39 per 1,000
1904	54 per 1,000
1906	60 per 1,000 (estimated)

The circular states the belief of the coal owners that this figure will increase to 200 per 1,000, which by the way is the actual percentage borne by the members who have been injured and relieved to the total membership of the West Riding Permanent Miners' Relief Fund (Yorkshire), a society having in the neighborhood of 30,000 members.

With reference to long disablement cases the South Wales Coal Owners' circular states that the percentage of men disabled for periods over twelve months was in 1903, 6.72 per 10,000, in 1904 14.87, and in 1905 17.66 per 10,000, and this notwithstanding a steady decline in the actual number of serious accidents, such as fractures, which in 1904 was only 221 compared with 258 in 1900. Internal injuries and strains, correct diagnosis of which is difficult, are responsible for the most persistent cases.

An Act such as the one under consideration bears more hardly on the coal owner than on anyone else. The work of a miner is accomplished under certain acknowledged risks, which he accepts, and in consideration of which he is paid a higher wage than perhaps any other laboring man. He is more subject to minor accidents than any other workman, accidents of from one to three weeks' duration of disability. The principal of compensation according to wages earned works therefore to his great advantage, and to the mine operator's equal detriment. Eventually a compensation bill must react upon the miner, for coal operators cannot continue to pay high wages and compensation for accidents pro rata without raising the price of coal or forcing a reduction in wages.

The present system of accident relief among the majority of Canadian mines is provided by joint contributions of the men, the employers, and the Government; a scheme very similar to that which obtains in Germany, and which has been found to work very well both there and here. The chief evil of such an Act as the Compensation Act of 1906 is its marked tendency to foster malingering, which it does chiefly by reason of an absolute divorcement of responsibility from the workmen, and the laying of the entire onus on the shoulders of the employers. It would seem that the most equitable arrangement for Canadian conditions would be an amplification of the present colliery relief funds. Any legislation along the lines of the Compensation Act of 1906 is quite uncalled for, and would seriously hamper the growth and development of coal mining in Canada, and would confer a very doubtful benefit on the miner. In England its effect has been to sap the moral integrity and the manly independence that used to characterize the "collier laddie." In saying this, we refer to minor accidents and some permanent cases. The death compensation payment is not open to this objection. In some cases the sums paid over to widows have been shamefully squandered, but some provision for widows and dependants of men killed at work should in all justice be provided. But it should not all be expected from the coffers of the coal operator, whether death occurred through "serious and wilful misconduct" or not, as it now is. Even a "coal baron" has his rights.

It is often urged that the provisions of the Compensation Act are such as to ensure greater safety to the workmen, because of the extra care taken by the employer to guard against his liability. In the case of factories or where there is much machinery this may be more or less true, but it is not so true of the actual work of mining, where more than perhaps in any other avocation the ceaseless vigilance of the miner himself is the best guarantee of his safety, and it is not equity to saddle the mine operator with the consequences of his employee's negect. Everybody who knows the inside of a mine knows also that careless and reckless men are to be found among miners, or else why have we laws by which men are bound to take reasonable precautions for their own safety and why do prosecutions occur for breaches of these laws? That a man can be punished by law for misconduct of this kind, and yet if it happens that he is seriously disabled or killed by reason of such misconduct his employer must pay therefor, are anomalies the non-legal mind cannot quite comprehend or reconcile.

Goldfield's Production.

The total production of Goldfield from the inception of the camp up to June 1st, 1907, amounted to $12,762,000. This year's production will be about $16,000,000. September returns gave $1,350,000 as compared with $1,600,000 for August and $2,000,000 for July.

ELECTRIC ZINC SMELTING.*

FREDERICK T. SNYDER.

(Mineral Point Meeting, September, 1907.)

Your secretary, Mr. Girling, and Mr. George S. Parker, have kindly asked me to tell you something of the efforts that we have been making to improve the metallurgy of zinc. As some of you know, we are responsible for the design and development of the high intensity magnetic separators which are now operating on a large basis at Leadville in Colorado and at Valerdena and Santa Barbara in Mexico, raising the grade of unroasted zinc ore.

It was while confronted by the difficulties of this separation that it occurred to us to strike directly at the root of the principal troubles of zinc reduction (the clay retort) and attempt to put the extraction of zinc on the basis of large stack furnaces. Iron, copper, lead are smelted in bulk in single furnaces, putting through from 200 to 500 tons in each 24 hours. The reason why zinc ore cannot be smelted in an iron or lead blast furnace is well known—the oxygen of the blast burns the reduced zinc black to oxide as fast as it is formed. In such furnaces the object, and the only object, of the blast is to furnish heat by burning the coke in the charge. If this heat be put into the stack by means of an electric current, as it is put into the filament of an incandescent light, the blast is not required and zinc as reduced will remain metal and may be condensed and removed.

Without going into the technical details of this electric stack method, I may say that these furnaces look like an ordinary lead or copper water-jacketed furnace, but are provided with electrodes for carrying in electricity in place of the tuyeres for carrying in a blast. The ore is fed in at the top and is entirely melted down, the residues being tapped as slag. The zinc condenses on the inside of the walls and spelter and runs down and is drained off. No blast is used, all the heat being put in with an electric current.

This solution, simple as it is, required an unexpected length of time to put into practical operative apparatus, but has now reached a form where we are warranted in considering what it means commercially to the mine owner. It is an economic truth that in the long run improvements in process accrue to the benefit of the owners of raw material. Excessive smelting profits soon attract new capital, which reduces the net return to a normal interest basis. But no amount of investment can increase the grade of mineral in a deposit. To render the lower grade available for shipment a reduction must be made in the total cost of extracting and delivering the contained metal to the consumer.

For the purpose of arriving at definite figures, we can consider the result of two plants, each of 25,000 tons annual capacity, operating under equivalent traffic conditions in the Illinois coal field, one using retorts and the other an electric stack furnace. Incidentally it may be remarked that single electric zinc furnaces of 50,000 tons annual capacity now appear practical.

The first cost of the present type of retort plant, including land, buildings and machinery, but excluding working capital, will be some $400,000. The equivalent first cost of the electric stack plant, including steam-driven electric generating machinery, will be substantially the same. Of this $160,000 is the cost of the stack plant and $240,000 the cost of the electric generating plant. Where current can be purchased from an existing power plant, the total cost of the electric stack plant is considerably less than half the cost of a retort plant.

General operating cost items for salaries, interest and depreciation are substantially the same for the retort plant and the electric stack furnace.

The operating cost item of labor in a modern retort plant burning coal with mechanical roasters may be taken at $4 per ton of raw ore. The labor in a stack plant may be kept well under $3 per ton. While this result might naturally be expected from using one compact vertical iron-jacketed furnace in place of 2,000 horizontal clay retors, it also depends on items not so obvious. The area of the stack plant is much smaller and distances over which material has to be handled are less and the continuous treatment admits the introduction of ore-handling machinery. With the electric stack furnace the sulphur does not have to be roasted as low as with retorts; 6 per cent. of sulphur in the electric stack furnace will give as good an extraction of zinc as 1 per cent. sulphur with retort furnaces. This practically doubles the duty per square foot of hearth area of the roasters. The weight of the stack slag is less than one-half the weight of the retort residues and less than one-quarter of the bulk. The results of operating the electric stack furnace are to a large extent independent of the skill of the furnace men, being determined, as in lead and copper smelting, by the metallurgist. This renders the electric stack plant, when starting up or in the event of labor troubles, much less dependent on a supply of specially skilled employees.

Considering fuel, it may be taken that a regenerative retort plant will burn 4,200 pounds of coal per ton of raw ore. Of this 600 pounds will be used in roasting. With the electric stack furnace it takes 1,200 horse-power hours of electricity per ton of raw ore, or 50 horse-power per day of 24 hours. The Fisk street station of the Chicago Edison Company is delivering one horse-power for one hour in electricity at the switchboard with the consumption of less than 1 1-2 pounds of medium grade coal. This amounts to 1,800 pounds of coal per ton of zinc ore and is practically constant, whether the ore is high or low in zinc. So, aside from roasting, the electric stack plant uses one-half the coal that a retort plant uses. As roasting for stack smelting takes less than one-half the coal that roasting for retort work requires, the total coal consumption of the electric stack plant is not more than one-half that of the retort plant. The saving is substantially one ton of coal per ton of ore, amounting to 75 cents.

With the retort plant 800 pounds of reducing material will be used per ton of raw ore; with the electric stack plant 200 pounds, assuming in each case a furnace charge carrying 50 per cent. of zinc. With normal prices this saving amounts to 55 cents per ton of raw ore.

With the electric stack plant there are no clay retorts and all cost items incident to their manufacture are absent. The items involved in the supply of new retorts amount to 40 cents per ton of raw ore. With a stack plant, however, an item of expense is present which is absent in a retort plant. To smelt 25,000 tons of ore will require 100 tons of electrodes, costing $50 per ton delivered, which is equivalent to 20 cents per ton of raw

*Transactions Tristate Mining Association.

ore. Repairs and renewals on iron work and machinery will be substantially the same in each plant.

Summing up these differences of operating costs, it appears that the electric stack plant costs $2.50 less per ton of raw ore to operate than the retort plant.

When we consider the results of operation, the electric stack plant produces results of equal interest. With reference alone to the zinc tenor of the ore, the lower the grade of the ore the more slag produced, and the higher the grade of the ore the higher zinc percentage will the slag contain. Within practical working limits, changes in these items substantially counterbalance each other. In other words, the amount of zinc lost per ton of ore is a fixed amount, independent of the grade of the ore, and is less than 50 pounds per ton of ore. With a retort plant it is also substantially independent of the grade of the ore and with good work may be 150 pounds. The increased recovery due to the stack plant, with zinc at 4 cents, will have a value of $4.00 per ton of ore.

With the electric stack plant, iron in the zinc ore improves the operation of the stack furnace. Up to the point where the percentage of iron equals one-half the percentage of silica, iron is required in the stack furnace charge and has to be added if absent. With an ore running 50 per cent. in zinc, and no lime, this means that an electric stack furnace requires an iron contents of 8 per cent. The higher iron limit with the stack furname, as compared with the retort furnace, will in some properties render it possible to cut out magnetic separation and in any event renders rougher concentration practicable.

With the electric stack furnace, any lead in the ore is reduced and saved separately, at the same time as the zinc. This makes it practicable to do rougher concentrating work and let the lead go in with the zinc, taking out only the gangue. With zinc concentrates containing 3 per cent. of lead, 50 pounds per ton of raw ore, or 2 1-2 per cent., will be saved in electric stack smelting and lost in retort smelting. At 4 cents per pound this is an item of $2. In addition, the lead penalty will be saved to the owner of the ore.

Lime is required in the charge in an electric stack furnace and is permissible in the roasting, as low sulphur is not required. With limey ore this saves the penalty to the mine owner. It also makes a saving of zinc, as with no lime penalty, close work is not so imperative, and less zinc is lost in the mill tailings. These items may reach $1.50 per ton.

Summing up these savings of metals in the electric stack plant over the results of a retort plant, makes a total of $7.50 per ton of shipping ore. This, taken together with the reduction of operating expense, makes a net difference between the retort plant and the electric plant of $10 per ton of ore. This is the direct result of using electricity for heat in place of coal, and involves no other important changes in the present metallurgy of zinc. This $10 does not include the present smelting profit but is in addition to and independent of the profit which the zinc smelter now makes. In other words, a smelter using electric stack furnaces can afford to pay the mine owner $10 more for each ton of zinc ore than can a zinc smelter using retort furnaces.



BRITISH JOURNALISTS IN FRONT OF COBALT'S OPERA HOUSE.

A STRAIGHT LINE CORLISS AIR COMPRESSOR.

H. A. Wainwright, M.E.

All engineers recognize in the Corliss engine the most economical means of compressing air by steam power. In the cross-compound type, one horse-power may be produced on from 14 to 16 pounds of feed water per hour, when running condensing, or 20 to 23 pounds non-condensing. But the price of the Corliss unit appears large to many operators, even in regions where the cost of the fuel saved would pay for the entire machine in a short time. Slide valve compressors are, therefore, often installed, which require two to three times as much fuel to do the same work.

The development of an air compressor combining high economy with moderate price has advanced but slowly. In some cases the principles of good mechanics have been distorted to the sacrifice of durability, ease of action and mechanical efficiency, in order to reduce construction costs. In others, various substitutes for the full Corliss valve gear have been offered. It is conceded that some of these compromise machines may fairly claim a certain degree of economy in operation, and that when a test is made under ideal running conditions, they make a good showing as compared with a Corliss compressor.

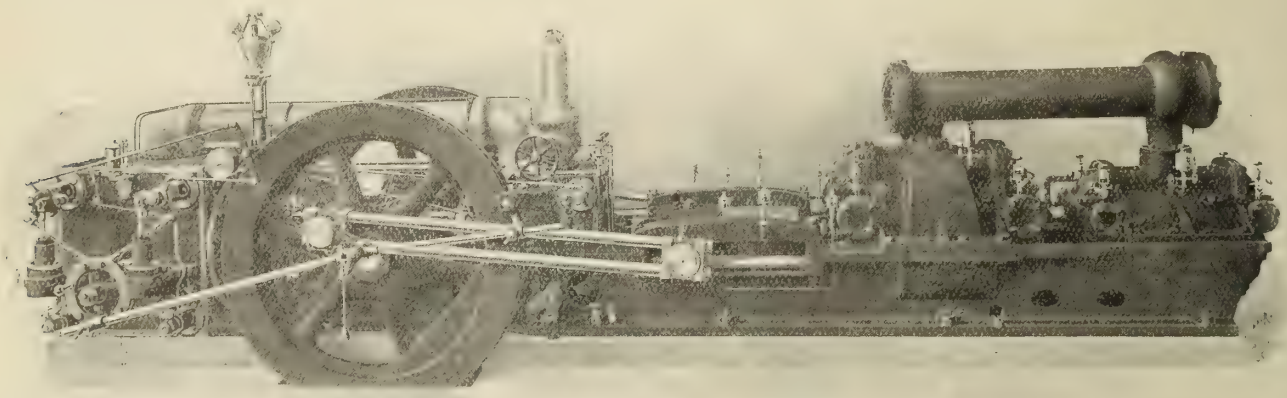
The conditions of everyday operation, however, are not one time in a hundred like those prevailing in a test. In the latter case, the steam pressure, air pressure, and speed are all constant, whereas in the former the fluctuation in any or all of these factors is likely to be extreme. Sometimes these extremes oppose one another, sometimes they may be high or low together. It is on account of this fluctuation that the Corliss compressor uses so much less coal in the course of a day's run. Its valve gear brings the cut-off in the high and low pressure steam cylinders under the automatic regulation of the governor. There is no wire-drawing of the steam, nor is there throttling action at any time.

A New Type.

A compressor has at last been designed, however, which embodies the economy of the Corliss cross-compound type in a form which permits moderate price without the sacrifice of good engineering. The credit for this achievement belongs to Mr. S. T. Nelson, one of the mechanical engineers of the Sullivan Machinery Company, and the superintendent of its western factory at Chicago. The new machine, known as the "Class WC," is described as a "tandem compound steam, two-stage air, Corliss straight line compressor." To put it differently, tandem compound steam cylinders with full Corliss valve gear on both have been attached to the flywheel end of the standard Sullivan two-stage straight line compressor, the high pressure steam cylinder occupying the same position as the single Meyer valve cylinder of the "WB-2" machine. The photograph shows the arrangement.

Design of Steam Cylinders.

The high pressure steam cylinder is of special design, to make room for the Corliss valve bonnets and dash pots between the cylinder and flywheels, and in order to do this, the steam chest is offset to one side. The dash pots for closing the steam valves are set directly on the main frame and the motion rods for operating the exhaust valves are arranged in the usual way, except that they are longer. Back bonnets are provided as usual and the frame is so designed that either one or all of the steam or exhaust valves may be removed without disturbing the valve setting. The low pressure steam cylinder is attached to the end of the frame by means of rigid distance pieces. The bottom feet of this cylinder are on the same level with the bottom of the main frame, and its weight is supported by an extension of the foundation. Practically the same pattern is used for making this cylinder that is used for the Sullivan cross-compound Corliss machines. It embraces all of the regular valve gear usually furnished with the latter type of machine.



There are no adjustments between the flywheels and the steam cylinders which require attention while the compressor is in operation. The piston rod stuffing boxes are packed with fibrous metallic packing, which needs only occasional care. The main bearings and other parts which cannot be oiled by hand while running, are lubricated by a system of pipes, leading from a cluster of oilers mounted at a convenient point, so that the engineer can tell at a glance when one of them is empty.

The eccentrics for operating the valve gear on both the high pressure and low pressure steam cylinders are located on the crank pin on the outside of the flywheels, so that they are easily accessible. The eccentrics, rocker arms, valve stems and all connections located between the flywheels or between the main bearings on the "WB-2" type are dispensed with in the "Class W.C." The governor pulley is all that is located on the shaft in their place. The removal of these parts allows the use of two piston rods between the high and low pressure steam cylinders, which are necessary in order to straddle the

crank shaft, which is kept in its original position in line with the cylinders.

Steam Regulation.

The governor is located on a separate mounting, and is a combined speed and pressure regulator. In appearance, it is of the Corliss fly-ball type, but it operates in unison with the pressure attachment. Either may also operate independently of the other when necessary.

The exhaust steam from the high pressure cylinder is carried around the outside of the cylinder barrel to the top by a passage cast with the cylinder, and discharges into a covered receiver pipe, extending from the top of the high pressure to the top of the low pressure cylinder.

Air Efficiency.

From the standpoint of air efficiency, this compressor takes the same high rank as the class WB-2 machine. The inlet valves on both low and high pressure cylinders are of the semi-rotary pattern, positively driven by motion rods from an eccentric pin on the engine flywheel. The action of these valves permits the cylinder to fill itself completely at each stroke, with air at the temperature of the atmosphere, and there is no wire-drawing or leakage. The discharge valves are of the automatic poppet type, so arranged as to reduce clearance losses to a minimum. They are removable by hand, together with the valve seats, so that the maintenance of a perfect fit is a simple matter.

The ideal of isothermal compression is approximated in these machines by means of unusually adequate cooling apparatus. This consists of heavy water-jackets on the air cylinders, and an inter-cooler of ample proportions, containing copper water tubes, across which the air must pass several times in its course from the intake to the discharge cylinder.

The "Class WC" compressor is built very substantially, being self-contained on its heavy frame and on the distance pieces connecting the two steam cylinders. These parts are sufficiently massive to sustain the low pressure cylinder of themselves, without the aid of foundations, if such a necessity should arise.

The straight-line type unites with its well-known advantages of engineering excellence the features of low weight, simplicity, and minimum foundations, as compared with duplex machines. These qualities render it possible to sell these compressors at a comparatively low price, to transport them readily and at small expense, and to erect them without elaborate and costly preparations at the desired site. They are built at present in sizes ranging from 909 to 2,450 cubic feet of free air per minute.

The Delaro plant of the Delaro Mining and Reduction Company is in full operation. It is designed to treat arsenic and cobalt ores. Arsenical ores are its specialty. A full description of the plant will appear in our issue of November 15th.



GROUP OF MINERS—FOSTER MINE, SUDBURY, ONT.

MINING OPERATIONS IN QUEBEC FOR THE YEAR 1906.

The report of the Superintendent of Mines for Quebec has just appeared. In summing up the year's production, Mr. Obaliski notes that production has risen from $3,755,000 in 1905 to $5,500,000 in 1906. Interesting discoveries of gold-bearing quartz are reported as having been made near Lake Opasatica, north of the County of Pontiac. The existence of cobalt ores at Chibogomo is taken as a hopeful sign that the great northern region from Temiskamingue to Mistassini when opened up by railways will prove a rich field.

In 1906 the country to the north of the County of Pontiac was explored. A map of this county accompanies the report.

The following are the principal mining and smelting operations reported for 1906:—

The Radnor and Drummondville charcoal iron furnaces produced 7,851 tons of pig iron, valued at $177,643. The ore smelted was principally bog ore. In connection with iron ores the report calls attention to the adaptability of the Gröndal process of concentrating and agglomerating iron ores to the magnetic sands of Quebec.

The Canada Paint Company and the Champlain Oxide Company produced 1,962 tons of calcined ochre, worth $19,620.

Of chrome iron ore the output was 8,961 tons, valued at $91,834, classified thus:—

1st class ore	417 tons	$ 4,743
2nd class ore	4,054 tons	34,375
Concentrates	4,490 tons	52,716
		$91,834

The first class contains about 50 per cent. sesquioxide of chrome, the second class about 45 per cent., and the concentrates 49 to 54 per cent. Prices were low, the 50 per cent. ore being worth $13 at the mine and the 45 per cent. $9.

The only copper mines operating were the Eustis and Nicholls mines at Capelton. The production was 32,527 tons, of which 24,642 tons were shipped to the United States and the remainder treated at Capelton for sulphuric acid and matte by the Nichols Chemical Company, which produced 374 tons of matte, containing 53 per cent. of copper. Some good prospects of copper ore are mentioned.

In lead, zinc and silver very little was done. The Wright galena mine and the zinc and galena mines of Calumet Island showed symptoms of activity.

Gold production was nil. Quebec may, however, become a modest contributor to our gold supplies very soon.

The production of asbestos has again increased, and prices have continued high. Nearly all the mines are in operation and new companies have been formed. At Thetford the King, Bell, Johnston and Beaver mines haves been in regular operation and have increased their output. The Shawinigan Water Power Company now supplies electric power to the Thetford companies.

The underground work of the Bell Asbestos Company is a new feature.

According to the company's reports, the total production of asbestos for 1906 was as follows, in tons of 2,000 pounds:—

	Tons.	Worth.
1st class crude	1,477	$324,380.00
2nd class crude	2,450	321,355.00
Fibre	18,542	815,962.00
Paper stock	39,906	681,956.00
Total	61,675	$2,143,653.00
Asbestic	21,119	18,875.00
Total	82,794	$2,162,528.00

Two thousand men, receiving $750,000 in wages, were employed for periods of from eight to twelve months. All the asbestos got out is sold at once. This industry is thus very flourishing, and the increased production was about 25 per cent. more than last year.

The production, exclusive of asbestic, for the previous years was as follows:—

	Tons.	Worth.
1904	35,479	$1,186,795.00
1905	48,960	1,475,450.00
1906	61,675	2,143,653.00

The amber mica industry has prospered. Talc, phosphate and graphite are in statu quo.

Kind of Minerals. (Tons of 2,000 lbs.)	Wages paid.	No. of workmen.	Quantities shipped or used.	Gross value.
Bog iron ore	2,200	120	18,331	61,175
Chromic iron	37,200	110	8,961	91,834
Copper ore	95,000	250	32,527	176,681
Asbestos	747,600	1,950	61,675	2,143,653
Asbestic		...	21,119	18,875
Mica (lbs.)		...	530,086	168,887
Calcined ochre	12,000	56	1,962	19,620
Phosphate		...	575	4,025
Graphite	23,800	83	125	8,300
Slate (squares)	16,000	50	5,469	24,446
Flag stones (yods.)	1,700	50	2,400	2,050
Cement (barrels)	136,000	300	405,103	625,570
Granite (cb. yds.)	238,761	653	51,873	560,236
Lime (bushels)	33,500	124	556,000	96,000
Bricks	300,000	1,462	94,000,000	525,000
Tiles and pottery.		...		270,000
cubic yards)	155,882	515	97,710	223,580
Totals	1,829,443	5,679		5,019,932

Limestone (cubic

Important changes have been made in the mining law with the view of facilitating its application, but without altering the principle.

On the 7th February, 1907, an order-in-council was passed classifying all minerals, except building materials, as metals. The price of mining lots was changed as follows: Superior metals, $10 per acre when more than 20 miles from a railway, and $20 when under that distance; inferior metals, $2 and $4 respectively. The fee for mining licenses was raised to $10. An amendment to the mining law was submitted to the Legislature, and

came into force on the 23rd March. It fixes the maximum area of land to be granted under a prospecting license to the same person, within a radius of 100 miles, at 25 square miles or 30 lots of 100 acres. Not more than 400 acres of mining lands can be sold to any one person in the same year within a radius of 100 miles. Miners or owners of inferior metals under mining patents have the first right to the purchase of superior metals.

A fee of $10 is exacted for registration of all transfers of mining rights.

Every application for a prospecting or for a mining license must be accompanied by the required fee and give an accurate designation or description of the land. The application must be addressed to the Honourable Minister of Mines. Reports must be sent in on the expiration of licenses.

COAL MINED BY MACHINES.

One of the notable features presented by the statistics of bituminous coal production in 1906, as in 1905, was the increase in the use of machines and in the quantity of machine mined coal. The percentage of increase in the production of machine mined coal in 1905 over 1904 was greater than the percentage of increase in the total production. In 1906 the quantity of machine mined coal was 15,451,075 short tons greater than in 1905, while the total production of bituminous coal increased 21,534,643 tons, showing that 72 per cent. of the increase in 1906 over 1905 was in the machine mined produced. The statistics also show that the average output for each machine in use increased from 10,258 tons in 1904 to 11,258 tons in 1905, and to 11,638 tons in 1906.

The total quantity of coal produced by the use of machines in 1906 was 118,847,527 short tons, as against 103,396,452 short tons in 1905 and 78,606,997 short tons in 1904. The increase in 1906 was 15,451,075 short tons, or 15 per cent. The increase in 1905 over 1904 was 24,789,455 short tons, or 31.5 per cent., while that of 1904 over 1903 was only 623,103 tons, or 0.81 per cent. The number of machines in use increased from 7,663 in 1904 to 9,184 in 1905, and to 10,212 in 1906.

The percentage of the machine mined tonnage to the total production in the States in which machines are used has increased steadily each year. In 1899 this percentage was 23; in 1900 it was 25.15; in 1901, 25.68; in 1902, 27.09; in 1903, 28.18; in 1904, 28.78; in 1905, 33.69, and in 1906, 35.1.

Of the 10,212 machines in use in 1906, 5,911, or 58 per cent. were of the pick or puncher type; 4,144, or 40.5 per cent. were chain-breast machines, and 157, or 1.5 per cent., were long wall.

In the number of machines in use and in the amount of machine mined tonnage, as in the total production of coal, Pennsylvania stands far in the lead, with 45 per cent. of the number of machines and 45.6 per cent. of the machine-won product in 1906. The amount of coal mined by machines in Pennsylvania increased from 49,335,660 short tons in 1905 to 54,146,314 short tons in 1906. West Virginia ranks second in the number of machines in use, with 1,322, closely followed by Ohio, with 1,255. The position of these two States is reversed in the amount of coal mined by machines, Ohio's production by machines in 1906 being 20,004,416 short tons, while West Virginia's was 15,565,113 tons. Ohio stands first in the percentage of machine mined coal to the total product. Illinois, the third State in coal producing importance, ranks fourth in the production by the use of machines. Kentucky, the eighth in rank among the coal producing States, takes fifth place in the number of machines used and machine mined tonnage, and second in the percentage of the machine mined coal to the State total. Indiana comes next to Kentucky in the use of mining machines. The six States mentioned contribute over 90 per cent. of the total machine mined coal.

As a rule an increase in the use of mining machines is accompanied by an increase, both for the year and for the day, in the average production per employee. Striking exceptions, however, are shown by Alabama and Colorado. In Alabama the percentage of machine mined coal to the total decreased from 13.36 to 12.52 and the production per man remained the same; in Colorado the machine percentage decreased from 14.14 to 13.22, and the tonnage per man increased from 3.14 to 3.32.

TITANIUM.

Titanium, although generally spoken of as one of the rare elements, is really one of the more common ones. According to Dr. F. W. Clarke, chemist of the United States Geological Survey, it forms 0.43 per cent. of the surface rocks of the globe, and is much more plentiful than lead, zinc, copper, and other metals classed as "common." A great many schists and gneisses carry titanium, and it is found in appreciable quantities in clays—not only surface clays, but also those that have been dredged from the sea bottom.

Many iron ores contain titanium, and ores containing one per cent. or more have generally been avoided by miners, owing to difficulties experienced in smelting, due to thick, pasty slags; but it is claimed that when properly handled tintaniferous ores give no more trouble with slags than other iron ores. It is said that steel and iron made from iron ore smelted in a blast furnace running on the titaniferous ores of the Adirondacks took a prize at the London Exhibition of 1851. The addition of titanium to cast iron greatly increases its strength, and an alloy called ferro-titanium is now manufactured at a number of places in this country and Europe for use as an agent by which to introduce the tintanium into the iron. It is believed that titanium is used by various firms to increase the tensile strength and elastic limit of steel, and although much secrecy is maintained concerning the matter, it seems probable that some steels that are imported as vanadium steels are in reality titanium steels. As titanium, unlike other metals used for the same purpose, such as vanadium, molybdenum, and tungsten, is plentiful and cheap, its successful use in steel hardening should establish a large market for it.

Several firms are now experimenting with titanium filaments in incandescent electric lamps, but the reduction of titanium to a metal is so difficult that the lamps have not yet been extensively placed on the market.

Titaniferous magnetite and titanium carbide, the titanium of which is derived from rutile, are used as electrodes in arc lamps. When one electrode is made of these substances a block of carbon is used for the other. The best known rutile deposit in this country, the one which produced the greater part of the titanium output in 1906, is at Roseland, Nelson County, Va. A few pounds were produced in Chester County, Pa., where the product is said to occur in comparatively large crystals and to be very pure.

A new use for titanium as a detector of minute quantities of fluorine has been worked out in the chemical laboratory of the United States Geological Survey by George Steiger.

COAL BRIQUETTING IN THE UNITED STATES.

Paper read at Toronto Meeting of A.I.M.E.

(Continued from last issue.)

Early in 1906 the Renfrow Briquette Machine Company was incorporated under the laws of the State of Missouri with $1,000,000 capital; W. C. Renfrow, president; J. M. Smith, secretary and treasurer, and E. D. Mizner, superintendent. This concern is a close corporation, and the company will not offer for sale any machines until after the Kansas City plant has proved successful. As far as can be learned, the construction of the Kansas City plant was brought about by the willingness of its presidentfi Mr. J. H. Durkee, to accept a Renfrow machine without a guarantee, simply on the strength of the work done at the coal testing plant. There are, of course, still some difficulties to be overcome, as in the case in the operation of any new plant, but in the main the mechanical operations of this plant are satisfactory, and the Renfrow Company has been able to deliver what it contracted to do. Financial difficulties have threatened the life of the plant under the present organization, but Governor Renfrow has affirmed that he will not allow this plant to fail for this reason. A contract has been signed to deliver one of the machines to a company at Detroit, but under the terms of the contract no date is fixed for the delivery of this machine, and no guarantee from the Renfrow Company has been acquired. Governor Renfrow is also authority for the statement that the Detroit machine will not be delivered until after the Kansas City plant has been successfully operated and put on a commercial basis.

The Renfrow Briquette Machine Company has no plant of its own, but has under consideration the establishment of a factory in St. Louis. All of the other machines above mentioned were built in machines shops under contract. The Kansas City machine was built by the Excelsior Tool & Machine Company at East St. Louis, and all of the other machines by the Ramming Machine Company, of St. Louis.

North Dakota.

During 1905 ex-United States Senator W. D. Washburn, president of the Washburn Lignite Coal Company, erected a small plant at Minneapolis for experimental work in the briquetting of North Dakota lignite. The plant was too small to be operated successfully from a commercial standpoint. Several hundred tons of briquettes were made on this press without the use of a binder. The briquettes proved a satisfactory fuel for domestic purposes and for stationary boilers, but were not adapted to locomotive use, because the heavy exhaust draft in the locomotive has the effect of disintegrating the briquette before combustion and causes the throwing off of large sparks. This small experimental plant represents the extent of Senator Washburn's efforts to briquette North Dakota lignites.

Mr. Robert L. Stewart, also of Minneapolis, who is interested in lignite properties near Kenmare in Ward County, reports that he has been conducting a series of experiments with a view to the briquetting of this fuel, and as a result of his investigations the American Briquetting & Manufacturing Company has been organized, which contemplates the construction, during the present year, of a briquetting plant in North Dakota, convenient to the lignite deposits, the plant to have a capacity of 1,000 tons of briquettes per day. Mr. Stewart says that the briquettes can be manufactured at a cost not to exceed $2 per ton f.o.b., this cost including the expense of mining the lignite and delivering it to the briquetting plant.

Texas.

Three companies have been organized in Texas recently for the purpose of briquetting the lignites which occur in great abundance through the eastern part of that State. These are the International Compress Coal Company, of Houston; the American Lignite Briquette Company, of San Antonio, and the Eureka Briquette Company, of Rockdale. The plant of the last mentioned company has been erected and is ready for operation at the time of the writing of this report, except for the fact that the drying apparatus has been found too small, and the plant has been shut down pending the erection of a larger drier. The details of the plant have not been obtained.

The American Lignite Briquette Company, while incorporated at San Antonio, will locate its plant at Rockdale, and the plant will be operated in connection with the lignite mines of J. J. Olsen & Son. The company has purchased a press made by the Klein Briquette Company, of St. Louis, and the plant will probably be in operation by the time this report is ready for distribution.

The International Compress Coal Company has been negotiating for the construction of a plant, but no actual building had been begun at the time of writing this report. All of these plants expect to use asphaltic pitch made from heavy Texas oil.

Florida.

In September, 1905, the Orlando Water & Light Company, of Orlando, completed the installation of a plant for the treatment and briquetting of peat, which occurs abundantly in the low-lying lands of Florida. The plant is located about 3 miles from Orlando, on the border of a peat bog, from which its supply is drawn. As originally installed, this plant consisted of a macerating machine or pug mill, in which the fibre of the peat is entirely destroyed, and a brick press. The briquettes, as they came from the press, were about the size of an ordinary building brick, and when dried in the sun shrunk to about one-fourth their former bulk and lost from 75 to 85 per cent. in weight. The briquetting feature of the plant was abandoned in the summer of 1906, as it was found that this part of the work represented 75 per cent. of the total cost, and that a satisfactory fuel could be made without briquetting. The method of treatment at the present consists simply of "machining" the peat in the pug mill and dumping it in masses of several hundred tons. As the peat dries it shrinks and cracks into large irregularly rectangular blocks, which are broken off from the heap and stored. When thoroughly dried these blocks make a good hard fuel, which, it is stated, may be used for both locomotive and stationary boilers, for household purposes, and for the manufacture of gas. Tests of the machined peat for producer gas at the United States Geological Survey coal testing plant gave excellent results.[13]

The machine used at the Orlando plant was built by the Moore & Wyman Elevator & Machine Works, South Boston, Mass., under patents issued to the late T. H. Leavitt, of Boston.

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[13]Report on Peat, by M. R. Campbell, *U. S. Geological Survey, Mineral Resources of the United States,* 1905, pp. 1319 to 1322.

USE OF THE DIVINING ROD.

Numerous devices are used throughout this country for detecting the presence of underground water—devices ranging in complexity from the forked branch of witchhazel, peach or other wood to more or less elaborate mechanical or electrical contrivances. Many of the operators of these devices, especially those that use the home-cut forked branch, are perfectly honest in the belief that the working of the rod is influenced by agencies—usually regarded as electric currents following underground streams of water—that are entirely independent of their own bodies, and many uneducated people have implicit faith in their ability to locate underground water in this way.

In experiments with a rod of this type, one of the geologists of the United States Geological Survey found that at points it turned downward independently of his will, but more complete tests showed that the down-turning resulted from slight and—until watched for—unconscious changes in the inclination of his body, the effects of which were communicated through the arms and wrists to the rod. No movement of the rod from causes outside the body could be detected, and it soon became obvious that the view held by other men of science is correct—that the operation of the "divining rod" is generally due to unconscious movements of the body or of the muscles of the hand. The experiments made show that these movements happen most frequently at places where the operator's experience has led him to believe that water may be found. The uselessness of the divining rod is indicated by the facts that the rod may be worked at will by the operator, that he fails to detect strong currents of water running in tunnels and other channels that afford no surface indications of water, and that his locations in limestone regions where water flows in well-defined channels are rarely more successful than those dependent on mere guesses. In fact its operators are successful only in regions in which ground water occurs in a definite sheet in porous material or in more or less clayey deposits, such as the pebbly clay or till in which, although a few failures occur, wells would get water anywhere.

Ground water occurs under certain definite conditions, and as in humid regions a stream may be predicted wherever a valley is known, so one familiar with rocks and ground water conditions may predict places where ground water can be found. No appliance, either electrical or mechanical, has yet been successfully used for detecting water in places where plain common sense or mere guessing would not have shown its presence just as well. The only advantage of employing a "water-witch," as the operator of the divining rod is sometimes called, is that skilled services are obtained, most men so employed being keener and better observers of the occurrence and movements of ground water than the average person.

Tungsten.

During 1906 the prices paid for tungsten ore ranged from $5 to $9 per unit for the contained tungsten trioxide. The market for tungsten ores is expanding, and seems now to be as sure as for the staple ores. Buyers have had difficulty in obtaining supplies for future deliveries. As a filament in an incandescent lamp, metallic tungsten has been given a new use during the year. In this it has proved remarkably successful.

CANADIAN COINS.

By statute the weight of silver, copper or bronze coins for circulation in Canada are fixed as follows:—Silver coins, from the fifty cent piece down to the five cent piece, must be composed of thirty-seven fortieths of fine silver and three fortieths of copper, a millesimal fineness of 925.

Name of coin.	Weight in grains; subject to testing provisions.
Fifty cents	179.3336 grains
Twenty-five cents	89.6668 grains
Ten cents	35.8667 grains
Five cents	17.9334 grains

The pieces of fifty cents are to be weighed separately with a remedy of 1.024 grains.

The pieces of twenty-five cents are to be weighed separately with a remedy of 0.594 grains.

The pieces of ten cents are to sampled in groups of one dollar's worth and weighed against the standard dollar weight of 358.6673 grains with a remedy of 2.844 grains. The prices of five cents are to be sampled in groups of one dollar's worth and weighed against the standard dollar weight of 358.6673 grains, with a remedy of 3.485 grains.

The one cent piece is to be composed of mixed metal, of copper, tin and zinc in the following proportions:—

95 per cent. of copper.
4 per cent. of tin.
1 per cent. of zinc.

Its weight will be 87.5 grains, with a testing provision or remedy of 140 grains. It is to be sampled in groups of eighty and weighed against a weight of one pound avoir dupois.

VANADIUM IN THE UNITED STATES.

Vanadium, one of the rare metals, is used principally for hardening steel, especially in connection with chromium. The addition of a very small quantity of vanadium to chrome greatly increases its tensile strength, affording a steel that is much used in the axles and other parts of the higher priced automobiles, as well as for the stronger parts of other machines.

Roscoelite, a vanadium mica, occurs in commercially valuable deposits in Southwestern Colorado, where it was mined and reduced in 1906. The ore contains about 2 per cent. of the metal. The product, an iron-vanadium compound, is shipped from the reduction plant at Newmire to Niagara Falls and smelted by electricity to a ferro-vanadium containing about 25 per cent. of vanadium and selling for $5 per pound of the contained vanadium. Another Colorado plant, at Cedar, produces vanadium as a by-product in the concentration of carnotite ores, about 20 per cent. of the concentrates being vanadium oxide. Vanadinite and other ores of the metal are found in small quantities in Colorada and Utah, as well as in the Southwestern States.

Vanadium salts are used in medicine, in ink and dye-making, in coloring glass, and in chemistry. Vanadic acid is used as a pigment, affording a golden bronze that is very little inferior to true gold bronze.

The occurrence and production of vanadium and other rare metals in the United States is discussed by Frank L. Hess, geologist, in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," just issued by the United States Geological Survey.

THE ORIGIN OF DEPOSITS OF PYRITES.

(Toronto Meeting, 1907.)

By A. B. Willmott, Sault Ste. Marie, Ont.

On studying the literature concerning the origin of deposits of pyrites, it becomes evident that there are several theories, each with strong supporters, and that even for the same deposits observers are not agreed. For a number of our deposits in Ontario the mode of origin seems to be fairly clear. This paper deals with the occurrences in Ontario, and only incidentally with others.

The four important theories regarding the origin of pyrites may be tabulated as follows:—

1. Impregnated beds.
2. Veins.
3. Sedimentary beds.
4. Magmatic segregations.

The first assumes that iron and sulphur as a soluble salt has found its way into porous beds, and been there precipitated as the sulphide. The country rock has in most cases been more or less replaced. Fracturing of the rock has promoted circulation. The mode of formation is similar in most respects to the second or vein deposits, and there are cases where the two methods are indistinguishable. The third theory assumes the precipitation of iron sulphide from solution as a bed at the bottom of shallow water. Other chemical and mechanical sediments occur above and below such beds. This theory in common with the first and second, pre-supposes the iron and sulphur in the form of a soluble salt, and precipitation brought about through a change in conditions. The fourth theory supposes that the iron sulphide has separated out of a cooling igneous mass. Several physical principles are suggested to account for the segregation. The following citations and quotations are given to illustrate current opinions.

Beck[1] in his treatise on ore deposits cites no instance of a pyrites deposit formed by sedimentation, magmatic segregation, or deposition in a vein. Under his division of Epigenetic Ore Deposits in Stratified Rocks, exclusive of veins, he gives a number of examples. These are sub-divided into those occurring (a) In crystalline schists; (b) as impregnations within non-crystalline strata. Both varieties are considered to be due to ore-bearing solutions depositing their load in porous strata. The deposits at Bodenmais, Germany; Sain-Bel, France; Ducktown, Tennessee; and severals in Norway are described as examples of the first. As examples of impregnations within non-crystalline strata, Beck mentions the deposits of Rammelsberg and Meggen, Germany, and of Rio Tinto and others, Spain. Beck quotes other authors holding different views on some of these deposits, whose opinion he, however, controverts.

Beck[2] sums up his conclusions upon epigenetic ore deposits as follows:—

"The two fundamentally opposite genetic views, whose rivalry at the present day is keener than ever before in the history of economic geology, have been presented and weighed one against the other in the descriptions which we have given of numerous stratified deposits of sulphide ores of the most diverse composition and age.

"The sedimentary theory assumes that strata consisting of sulphide ores, sometimes of considerable thickness, have been deposited on the bottom of the ocean or sometimes of a shallow coastal sea, exactly like limestone or rock salt beds, or at any rate purely chemical precipitates of such sulphide ores were deposited by sea water in small particles associated with the normal sediments.

"The other is the infiltration theory, according to which such deposits are due to a subsequent mineralization of ordinary sediments, at a much later geologic period, by means of an infiltration of ore solutions derived from fissures.

"We believe that the reader must have gained the conviction that the conditions of structure and position actually observable argue, in most instances, rather in favor of the second hypothesis. This is particularly true of the beds of sulphide ore in crystalline schists. The lack of constancy of position in otherwise uniformly stratified ore deposits, the limitations of the beds to portions of rock strongly influenced by dislocations and traversed by eruptive rocks, the occasional occurrence of offshoots (ueberschneidungen) at the boundary of such ore bodies with the sediments, the occasional presence of vein-like spurs and stringers, and above all the miscroscopic relations of the ores to the other rock constituents, which often point to a later segregation of the metallic compounds—all these speak in favor of the infiltration theory."

Beck then considers to what extent chemical precipitates of sulphidic ores are now being made, and concludes that there is nothing now forming which would account for the vast pyrite accumulations of earlier ages.

Kemp[3] groups "Pyrite Beds" with magnetic deposits, which they closely resemble in form and occurrence. "Some pyrites lenses may have accumulated in a way analogous to the bog ore hypothesis, cited under 'Magnetite,' but instead of the iron being precipitated as the oxide, it has probably come down as the sulphide from the influence of decaying organic matter, and has subsequently shared in the metamorphism and solidification of the wall rock. At the same time it must be admitted to be an obscure point. By many they are thought, with more reason, to have originated like a bedded fissure vein whose overlapping lenticular cavities have been veins are on lines of dislocation beyond question. Reformed by the buckling of folded schists. The Ducktown placements of pinched beds of limestone are always to be considered, and the presence of intruded dikes, though disguised by metamorphism, is always to be kept in mind."

In the following chapter he describes pyrite or pyrrhotite beds (veins) with intermingled chalcopyrite, and writes: "Whether the deposits are true beds or veins parallel with the foliation is as yet a matter of dispute. The resemblance to magnetite suggests a bed and this view is generally taken by German writers. The California mines occur closely associated with the auriferous (pyritous) quartz bodies, which are always esteemed veins. But as detailed knowledge increases, it is more and more appreciated that the ore bodies are mostly if not entirely veins, and have been deposited along lines of dislocation."

J. H. L. Vogt has been the leading exponent of the theory of magmatic segregation of pyrite deposits, and also of pyrrhotite. Doctors Coleman and Barlow, of our own Institute, are strong supporters of this origin of our Sudbury pyrrhotites.

From the quotations given it is evident that the present tendency is to consider all pyrite deposits as veins or impregnated beds. In this paper the position is taken that for many of our Ontario deposits a sedimentary origin must be predicated. If some deposits are undoubted sediments it probably follows that at least some of the foreign deposits which have been explained both on

the sediment and impregnation theories were made in the former way.

Turning now to the Ontario deposits, several may be considered in detail. Among the most important is that near the Helen iron mine, Michipicoten. The ore is a mixed hematite and limonite, which in places holds pockets of fine granular pyrites resembling artificial conand is free from impurities. The pockets found vary from a few cubic feet up to chimneys 20 feet across and 100 feet high. The line of separation between the pyrites and hematite is usually very marked. At times there is a gradual transition. At points in the hematite mine hard ore is found carrying considerable intermixed pyrites. Usually this ore is somewhat banded and quite silicious. North of the hematite ore body there is several hundred feet of banded hematite and chert standing almost vertical. To the east of the iron mine a steep hill rises 400 feet, along the brow of which a band of impure cherty siderite is seen. Scattered through this siderite is a considerable amount of pyrites. The siderite weathers much more rapidly than the pyrites.

On the west the iron ore now being mined is bounded by a diabase dike which crosses the iron formation nearly at right angles. West of the ore body there was originally a small pond known as Boyer Lake. This pond was about a quarter of a mile long, hardly as wide, 133 feet deep, and rock-rimmed throughout. Diamond drill holes have shown, beneath forty feet of mud in the bottom of this lake, 140 feet of pyrites fines. Exploration is not complete, but a pocket of over 100,000 tons has been shown. The only explanation of the origin of this rock-rimmed basin is by solution.[4] The siderite, with its pyrites, which is found at both the east and west ends of the lake, undoubtedly was continuous, and has been removed. The lose granular pyrites can best be accounted for as a residual product. That the pyrites is much more stable than the siderite is abundantly proved.

Adjoining Boyer Lake and along the strike of the iron formation is another pond, Sayer's Lake, of similar size and description. On the north side of the lake a railway cutting shows a small deposit of pyrite, pyrrhotite, and carbonaceous shale. On the south side a short tunnel discloses pyritic quartz rock, which in places is almost pure pyrites. This material resembles the pyritic quartz mentioned before as occurring in the iron ore body, except for the lack of hematite. Where the outlet of Boyer Lake has been lowered a similar silicious pyrite, carrying 30 to 35 per cent. sulphur, occurs.

Everywhere along the Michipicoten iron range similar associations are found. A mile west of the Josephine siderite with large amounts of pyrites occurs. Near this a railway cut shows a lens of silicious pyrites carrying 25 per cent. sulphur. It is enclosed within the iron formation, and is undoubtedly part of it. One mile east of the Josephine banded silicious pyrite occurs. At Paint Lake oxidation of silicious pyrites has given rise to a bog deposit on the shore of the lake. For further descriptions reference must be made to the writings of Coleman, Bell and myself in the reports of the Bureau of Mines[5] on the Michipicoten Iron Range. The great majority of these numerous occurrences along the iron range are too lean to be of commercial value as sulphur ores.

The Goudreau Lake deposits in Township 27, Range 26, west of Missanabie on the Canadian Pacific Railway, are perhaps the largest in Ontario. Comparatively little work has been done, but from the known areas, and allowing a depth of only 100 feet, one million tons of pyrites exist. Much of this may be too low in sulphur to be of commercial value, but the prospect is very encouraging to the owners. The deposits are six in number and cover an area two miles in length by one in width. The country rocks are mainly Keewatin schists with some intruded greenstones. Characteristic iron range rocks also occur. The richer pyrite bodies are marked by depressions 10 to 50 feet in height. The smaller ones are only a few feet across; the larger, as on the Bear claim, are 250 feet. In some cases these depressions are roughly circular or oval as at deposit A; at others they are long and narrow as at C, where the depression is 500 feet long, and about 40 wide. Some little ponds in the vicinity of several of the deposits may fill the depressions due to weathering of pyrites, but this is not yet proven. The resemblance of these weathered pits on a small scale to Boyer Lake near the Helen is striking.

The ore is silicious, and granular silica similar to the iron range rocks, is frequently found. The character of the ore is exactly like the better quality of hard pyrites found at the Helen. Bands of siderite have not yet been noticed, but at several of the deposits crystalline limestone occurs near the pyrite. A diamond drill hole, put down at an angle of 42 degrees under deposit A, passed through three narrow bands of pyrites separated by calcareous schist, before reaching the main deposit 96 feet thick. A vertical hole from the bottom of the pit, after passing through a few feet of broken and oxidized material, went through four feet of ore higher in sulphur and much less dense than the usual ore. Either it is a layer from which the silica has been dissolved, or a bed formed by the precipitation of solutions from the gossan above.

Typical material from these deposits analyzes as follows:—

Silica	6.00 p.c.
Iron	44.36
Sulphur	40.28
Lime	.25
Magnesia	.53
Copper	Trace
Arsenic	Nil.
Lead	Nil.
Zinc	Nil.

That these deposits are only an extreme phase of the Helen iron formation is, I think, admitted by all who have seen them. The agreement is founded on the similarity of the adjoining rocks; the presence of banded chert and magnetite, though only in a small degree; the similarity of the silicious pyrites. The silicious pyrites along the south side of Sayer's Lake at the Helen, and the deposits along the south side of the lake at deposit B, Goudreau Lake, are extremely similar in appearance and mode of occurrence.

At Kaministiquia, 20 miles west of Port Arthur on the Canadian Northern Railway, the Davis Sulphur Ore Company opened a shaft on a pyrite bed. Here, also, the accompanying rocks are those typical of the iron formation as it occurs all through Ontario in the Keewatin. Hand specimens of this ore can be exactly matched at Michipicoten. Undoubted iron range rocks occur in close proximity.

At Strawhat Lake, near Atikokan, on the Canadian Northern Railway there is another occurrence of pyrites resembling those at Goudreau Lake. This deposit was originally opened by prospectors who were searching the iron range for iron. That the deposit is part of the iron range cannot be doubted. It must have been formed

with it, though possibly secondary concentration might be argued.

Near Schrieber, on the north shore of Lake Superior, is a pyrite deposit of a different character. The ore is associated with an eruptive diabase, and is considerably mixed with pyrrhotite carrying small amounts of nickel and copper.

Associated with the iron ranges in the Temagami Reserve are several belts of pyrites. These have been described by Professor Miller[6], and it need only be stated that in character and associations they resemble other pyrite beds found with the Keewatin iron formations. Several openings have been made at points on Temagami Lake, but the ore has proved rather too low in sulphur. In this it resembles the great majority of occurrences along the iron ranges. Only in places has the pyrites been accumulated sufficiently free from quartz to be of value. At these places, naturally, the resemblance to the pyritous chert of the iron ranges has been so much modified that it is not easy to recognize the connection. The deposit at Net Lake is, I believe, only a richer part of the pyritous cherts of the Temagami iron range. To be certain one should trace out the belt which I have not done.

In Hastings County are a number of deposits, several of which were originally opened for hematite iron. The deposits occur a sbeds in various green schists and are frequently associated with limestones. The boundaries of the ore bodies are not always distinct, but the ore gradually diminishes outwards until too poor to be of value. Parallel beds occur. The ore contains more lime and less silica than the deposits in Northern Ontario. The writer has not observed the pyritous chert of the iron ranges anywhere in the vicinity. The enclosing rocks are, however, very similar to those of Goudreau Lake.

In Lanark County there is a deposit differing from those so far described. It occurs in crystalline limestone and has the appearance of a vein rather than a bed. The crystals of pyrite are frequently large, well formed, and very pure.

Other large deposits in Ontario, as those at Nickel Lake and Dinorwic, the writer has not seen, and so will pass over; also other pyritous cherts of frequent occurcentrates. The ore runs 40 to 50 per cent. in sulphur, rence, but not differing from those already described.

The large number of deposits in Ontario and the more important in size, are, as shown above, closely associated with the iron ranges. Following along the strike, pyritous chert succeeds sideritic chert and is succeeded by silicious pyrite. More commonly these changes are noticed in crossing the strike. Cross sections of the range made by diamond drills show many alterations—banded cherts and hematite, pure hematite, pyritous hematite, silicious siderite with and without pyrite, pure pyrite, cherts free from all iron. No regularity of sequence has yet been noted if any exists. Descriptions of the Ontario iron ranges by Coleman, Miller, Bell and the author in various reports of the Bureau of Mines all agree on this close association. Van Hise[7] regards the pyrite as a chemical sediment and in part the source of the iron ore bodies. He writes:—

"In the Michipicoten district of Ontario, pyrite and marcasite occur rather plentifully within the original iron-bearing carbonates, and also very abundantly with quartz in associated rocks. Pyritic quartz rocks also occur in the Vermilion district in subordinate quantity. The iron sulphide to some extent has undoubtedly been a source of the ores. But however one may emphasize the importance of ferrous silicate and iron sulphide as a source of the ore bodies, it still remains true that the iron-bearing carbonates are the dominant original sedimentary rocks out of which the iron-bearing formations and ore bodies have been produced."

The rocks of the Helen iron formation have been more carefully studied than those of the corresponding formations in other parts of the Province. As all are closely similar, the description of the Helen series may be taken as applying to all. I quote from Dr. Bell[8] rather than from the earlier reports by Coleman and myself.

"The Helen formation consists of a series of allied and related rocks named in order of their importance in the region as follows:—Banded chert, massive granular chert, sideritic chert, pyritous chert, banded jasper, rusty quartzite, gruneritic and other amphibolitic schists, cherty siderite, and iron ores—hematite, magnetite, pyrites and even pyrrohtite. Between these rocks there is every phase of gradation. Besides these ferruginous rocks the formation includes a number of argillaceous rocks, phyllites, and biotitic and epidotic schists—all undoubtedly sedimentary—which are found not only interstratified with the ferruginous rocks, but also both above and below them, although always in intimate connection with them.

"The sideritic chert consists essentially of two minerals—quartz and siderite, with which are almost always associated chlorite, sericite, pyrite, oxidation products of pyrite and carbonate, and sometimes microcline and other feldspars. Examined microscopically, some of the quartz is seen to be clastic, but most of it is chemically precipitated, often in the form of chalcedony. Both microcline and chlorite, the former in rounded grains and the latter in plates with frayed edges, are fragmental, and their areas have been greatly reduced by the invading carbonate. Pyrite is frequently an inclusion in both the chlorite and carbonate, and it occasionally developes in secondary veinlets in association with chlorite, carbonate and quartz. Some of the sideritic cherts contain so much chlorite that they pass into cherty sideritic phyllites, or so much microcline that they become sideritic arkoses.

"The massive grayish, pinkish or whitish chert, when quite pure and undecomposed, is holocrystalline, and beneath the miscroscope is seen to consist of an interlocking mosaic of quartz. This is the 'sandstone chert' of the Michipicoten prospector. It is often markedly rusty, due to the oxidation of iron carbonate, and less frequently iron pyrites, both of which are nearly always present. With an increase of one or other of these minerals, the rock passes into a sideritic chert or pyritous chert."

These iron-bearing rocks are mainly chemical sediments, though some mechanical sediments are included. The adjoining rocks at Michipicoten are quartz porphyry schists supposed to have originated as volcanic tuffs. These, no doubt, fell as ashes on both land and water, in the latter case being rudely stratified. At intervals the volcanic activity naturally diminished and chemical precipitates formed a relatively larger portion of the sediments. Solutions of lime, iron, silica, and sulphur were carried to the water there to be precipitated. The recurrence of volcanic activity would overwhelm the chemical sediments in the mechanical ones. In this way the small lenses of siderite and silica in the tuffs adjoining the iron formation proper can be accounted for. Then came a long period of volcanic inactivity

when chemical sidementation again predominated. Silica and cherty siderite and pyritous chert were precipitated until beds several hundred feet thick were formed.

How the silica, iron and sulphur were dissolved and precipitated is not absolutely clear. Presumably the iron was partly transported as a carbonate and partly as a sulphate. Winchell[9], Clements[10], and Bell[11] have speculated on this point. How was the silica dissolved and how precipitated? The intimate mixture in the cherty siderite suggests that both the iron carbonate and the silica were precipitated together. The iron sulphide was doubtless reduced from the sulphate through the action of carbon. Considerable is still found in the shales adjoining the iron formation. Pyrite and silica were, however, precipitated together as shown by their intimate mixtures.

The pyrites in the iron ranges can be satisfactorily accounted for as a chemical precipitate. Can it be otherwise accounted for? The only alternative would be as a precipitate in porous beds introduced after their folding. One notes, however, that all the beds are not equally porous, and yet the pyrites is found in compact siderite, in very porous chert, in loose hematite and in hard, compact almost flinty quartz. Where the beds are brecciated one would expect to find abundant pyrites, and there is often none, as at Sayer's Lake. Soluble rocks like the siderite should contain pyrites in larger amounts than the compact flinty cherts, but the reverse is the case.

In Temagami, Professor Miller[12] finds two parallel iron ranges several miles apart, and separated by an intrusive greenstone mass. They dip in opposite directions, as the legs of an anticline. Overlying and parallel with them are two belts of pyrites. The occurrence can be explained as a bed of iron and silica covered by one of pyritous silica, the two folded into an anticline and the summit eroded. Or if the pyrite is not a bed, then one must suppose that solutions came up several miles apart, and impregnated beds parallel to the two iron beds. Obviously the former is the more likely.

We conclude, then, that for a number of our Ontario pyrite bodies the origin has been one of chemical sedimentation. For Strawhat, Lake Kaministiquia, Helen, and the Michipicoten range, Goudreau Lake, and the Temagami ranges this seems proven. For the Hastings occurrences there is not so good proof, though nothing is known pointing more strongly to another origin. The similarity of the Virginia deposits in Louisa County to those of Hastings appeal to me strongly. Possibly they may be replacement deposits, as suggested by Nason[13], but the writer has seen nothing about them unexplainable as a sediment.

References.

(1) The Nature of Ore Deposits, R. Beck, translated by W. H. Weed, 1905.

(2) Ib., page 521.

(3) Kemp. Ore Deposits of the United States and Canada, 3rd edition, 1900, pp. 184-189.

(4) Coleman. Bull. Geol. Soc., Vol. 13, pp. 293-304.

(5) Reports of the Bureau of Mines, Ontario, 1900, 1901, 1902, 1905.

(6) Bureau of Mines, 1901, pp. 169-173.

(7) Twenty-first Annual Report U. S. Geo. Sur., p. 319.

(8) Bureau of Mines, 1905, 307-8.

(9) Bull. VI., Geo. Sur.

(10) Vermilion Iron-bearing District, pp. 190, 227-234.

(11) Bureau of Mines, 1905, p. 311.

(12) Bureau of Mines, 1901, p. 173.

(13) Eng. and Min. Journ., July 28th, 1906.

URANIUM.

The current idea that uranium ores derive their value from their content of radium is probably due to the fabulous value ascribed to radium in many publications —a value based, perhaps, upon prices paid for it as a chemical and physical curiosity, since they are not justified by any uses thus far found for it.

The principal known deposits of uranium ores in this country are in Colorado, where carnotite and uraninite (or pitch blende) furnish the product. A reduction plant near Cedar, in San Miguel County, is operating on carnotite ores running 2 per cent. or less of uranium and having also a vanadium content. Deposits of carnotite near Meeker, in Rio Blanco County, discovered in 1906, were described by Hoyt S. Gale, of the United States Geological Survey, in Bulletin No. 315. The uraninite, or pitch blende, is mined in the Kirk, Wood, and German mines, in Gilpin County, Colorado. Small quantities of uranium have been found in the Black Hills as uranium phosphate (autunite). Other small deposits, of mineralogic interest only, have been found in Connecticut, North Carolina, Texas and California.

So far but few uses have been found for uranium ores. Experiments made with the metal as a steel-hardening material do not show that any particularly valuable qualities are added to the steel that are not given by the use of other elements that are at present cheaper. Uranium in the form of an acetate is used as an indicator in various determinations in organic chemistry, and other salts are used in iridescent glass and pottery glazes.

The occurrences and uses of uranium ores are described by Frank L. Hess, geologist, in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," just issued by the United States Geological Survey.

COAL BRIQUETTING IN CANADA.

The largest and most successful coal briquetting plant in America is built on Canadian soil. It is situated at Bankhead, Alberta.

The plant is the property of the Bankhead Mines, Limited, and has been running since March, 1907, producing 300 tons of briquettes in 24 hours. An additional unit is being installed, which will be completed and running about February 1st, 1908. This will increase the output to 500 or 600 tons per day. The process used is that of the Zwoyer Fuel Company, which briquettes the dust from the anthracite operations of the Bankhead Mines. Coal tar pitch having a melting point of 140 degrees F. is used as a binder. The resulting briquettes are a hard, clean fuel, which is used on the locomotives of the mountain division of the C. P. R. and by the domestic trade. Excellent results are obtained wherever the briquettes are used.

Notwithstanding the very high cost of binder, due to the long transportation and the high wages paid in this section of the country, these briquettes are made and sold at a profit.

BOOK REVIEWS

A MANUAL OF FIRE ASSAYING. CHARLES H. FULTON, PRESIDENT OF THE SOUTH DAKOTA SCHOOL OF MINES. XII. X, 178 PAGES, 6 BY 9 INCHES. ILLUSTRATED; $5.00 POST-PAID. HILL PUBLISHING COMPANY.

Upon the subject of fire assaying many good books have been written. In few of these books, however, have the authors freed themselves from a tendency towards empiricism. Indeed much of the literature of fire assaying is on a level with the cook-book standard.

Mr. Fulton has broken a path for himself. The book is broad in scope, practical in treatment, well illustrated, clearly printed and of encouragingly modest bulk.

In the first chapter, "Assay Furnaces and Tools," coke, gasolene and wood-burning muffles are illustrated. Longitudinal and cross sections of the brick-built furnaces are included. The cost of operation is estimated for each kind. This is a useful departure. The ingenious Keller multiple scorifier tongs are shown on page 14 and the Keller cupel charging device on page 15. By means of the former, lots of twenty-five scorifiers may be handled at one time. The latter device will charge 20 cupels with lead buttons simultaneously.

Chapter VI. is valuable. It treats of assay slags lucidly and simply. Chapter VII., on "Cupellation," contains information of the utmost importance to the assayer. For instance, the influence of impurities upon the cupellation of gold and silver is tabulated. Beginning with tin, which induces a loss of 2.0 per cent. gold and 13.9 per cent. silver and ending with tellurium, whose corresponding figures are 55.8 per cent. and 67.9 per cent., each of the most usual metallic elements is mentioned.

Space will not permit us to enumerate the many practical hints brought out by Mr. Fulton. Undoubtedly the material for this volume has been carefully selected. Moreover, it has been put into excellent shape.

The two concluding chapters upon "The Assay of Ores and Alloys Containing Platinum, Iridium, Gold, Silver, etc.," and "The Assay of Tin, Mercury, Lead, Bismuth and Antimony," round out the book very satisfactorily.

A pleasant evidence of modernity is the absence of antiquated wood cuts. The apparatus mentioned and represented is strictly up-to-date. No doubt this is a consequence of Western environment.

EXCHANGES.

The Toronto correspondent of the *Mining and Scientific Press*, October 19th, has a word of commendation for THE CANADIAN MINING JOURNAL. We are thankful for this. We are fighting for decency and honesty. Our Californian contemporary has removed the fur from many financial felines. Its approval is worth having.

"A Modern Illinois Coal Plant" is described in the October *Mines and Minerals*. The powder magazine of Saline County Coal Company is described as built of brick, clay, and concrete foundations. It has a tile coping, composition roofing, steel-faced door and tamped dirt floor. It has a capacity of two car loads of black powder. No dynamite is stored.

The *Mining World*, October 19th, contains the first of a series of articles on "The Asbestos Industry of Quebec," from the pen of the *World's* indefatigable travelling correspondent, Mr. Ralph Stokes. "The mines," writes Mr. Stokes, "are now in an enviable position of independence, with a market of assured strength and no prospects of menacing outside competition."

The *Engineering and Mining Journal*, September 28th, opens with the second of a series of articles by W. R. Ingalls on "Lead and Copper Smelting at Salt Lake." The incidental defects of the large Garfield copper smelter of the American Smelting & Refining Company are due, according to the writer of this article, to the fact that the company has too many engineers and does not trust its work entirely to a single competent man.

The South African Mines, Commerce and Industries, August 3rd, takes up the question of ventilation in the deep mines of the Rand. The prevalence of miners' phthisis is attributable to the "minute and deadly fragments which Main Reef ore powders into when bored by machine drills." The miners themselves are responsible for much of this. The men retain their prejudice against the use of respirators and sprays.

The Mining Reporter, September 12th, remarks upon the new mine tax law of the State of Arizona: "Under the new mine tax law, which has occasioned but little dissatisfaction, the larger concerns . . . are assessed higher and are withal bearing a more just share of the territorial government expenses." None of these larger companies, indeed, made any complaint. But a loud outcry was heard over the valuation of none-producing claims, fixed at $20 per acre.

"The Montreal River Silver District" is the subject of a well-illustrated article in *The Engineering and Mining Journal*, September 21st, by Reginald Meeks. "If the curses of 'wild-catting' and over-capitalization do not choke the legitimate enterprises, the district, as a whole, will undoubtedly prosper. But even at this early date there are rumors of companies being organized with capitals ranging from $1,000,000 to $5,000,000, without the least thought concerning the obligation these capitals mean."

In the *Journal of the Franklin Institute*, September, an article on "The Schuyler Mine" is concluded. A convenient method of determining ash is graphite is also described on another page. Combustion is effected by means of a stream of oxygen from an "oxone" generator. Oxygen made from chlorate of potash and manganese dioxide will also serve the purpose. About one-third gram of graphite is taken for analysis and mixed with about twenty milligrams of fine, carefully ignited magnesia. The stream of oxygen is delivered to the crucible by means of a clay pipe stem.

Writing of the gold measures of Tangier, Nova Scotia, in the *Mining and Scientific Press*, October 5th, Mr. George A. Packard mentions the quartz veins of the district thus: "The sedimentaries consist of slate and more or less metamorphosed sandstone, locally termed 'whin.' The veins occur in the slate, often near or at the contact with the whin. As far as I have had an opportunity to observe them, these slate 'belts' are not over seven feet wide. The quartz veins vary from a fraction of an inch to eight feet in width. They are made up of white quartz, with up to 2 per cent. of sulphides, and a varying, though considerable, quantity of included slate derived from the walls. The sulphides are pyrite, pyrrhotite, chalcopyrite, arsenopyrite and galena. The district differs from some others in Nova Scotia in that here the proportion of arsenical sulphides is very small."

The *Engineering and Mining Journal*, October 12th, opens with an article on the Mansfield copper mines in Germany. At these mines a new row of deep-level shafts

is being sunk. They are circular and of 6 m. diameter. Hoisting is done on double-deck cages, four trucks being raised at a time. Most of the shafts are equipped with cross-compound, conical-drum steam winding engines. The ventilation of the mines is secured chiefly by natural means, supplemented by Rateau fans at the surface at some of the shafts. The underground haulage is done by horses. Heap roasting of the ore brings the copper content to 3 per cent.

PERSONAL AND GENERAL

Mr. J. Groves has been appointed manager of the Brown Alaska Company's Nobles mine.

Mr. Norman McKenzie has been appointed superintendent of mines at Dominion No. 2 Colliery.

Dr. Frank D. Adams, Logan Professor of Geology at McGill University, arrived in Montreal from England on October 15th.

The head office of the Foster Mining Company has been removed from the Traders Bank Building to Room 74 Home Life Building.

Mr. J. H. Plummer, president of the Dominion Iron & Steel Company, sailed for England on the Empress of Britain on October the 18th.

Mr. Harris, formerly superintendent of the Hall Mines smelter, is now filling a similar position under Mr. T. Kiddie at Hadley, Prince of Wales Island.

Mr. John McMartin and Mr. H. Timmins, of La Rose Syndicate, are in England. They are reported to be negotiating the sale of two of their mines.

Mr. H. J. Fuller, president of the Canadian Fairbanks Company, Limited, sailed on the 18th of October for England on a six weeks' visit.

Mr. A. F. C. Ross, auditor of the Canadian Mining Institute, has been elected president of the Dominion Association of Chartered Accountants.

Canadian correspondents are informed that Mr. J. D. Kendall, consulting mining engineer, has removed to Friars House, New Broad St. London, E. C.

Mr. J. Macaulay, who until recently was in charge of the La Plata mine at Nelson, has left for the east, the property being operated under the direction of Capt. T. H. Thethewey.

Among the visitors to Montreal this week were Mr. Alexander Dick, of the Dominion Coal Company, and Mr. H. E. Rice, superintendent of the Dominion Iron & Steel Company's rod mill, at Sydney, C.B.

Mr. J. F. Robertson, who since May last has acted as assistant to Mr. F. Keffer, engineer of the British Columbia Copper Company, is now on the engineering staff of the Mond Nickel Company at Victoria Mines, Ont.

Among recent visitors to Victoria was Mr. Arthur Hebden, secretary of the Southern Cross Mining & Smelting Company, a British enterprise owning properties on Vancouver Island. It is stated that the company has completed arrangements for the erection of a smelter near the mouth of Alberni canal.

A meeting of the committee appointed at the last annual meeting of the Canadian Mining Institute to prepare and offer certain suggestions to the Ontario Government with a view to securing an amendment of the Act, "Supplementing the Revenues of the Crown," will be held at the King Edward Hotel, Toronto, on October 31st and November 1st.

Dr. J. MacIntosh Bell, Director of the New Zealand Geological Survey, passed through Toronto recently on his way to New York. Before returning to New Zealand Dr. Bell will deliver a series of lectures at Harvard, Yale and Princeton Universities. The past few weeks Dr. Bell spent in visiting Cobalt and other mining districts.

At the Spokane Interstate Fair, which was held early in October, the prize for the best mineral display was awarded to the Kootenay district. This exhibit, which had previously been shown at the Nelson Fair, was arranged and collected by Mr. N. V. Cavanaugh, assisted by Mr. H. E. Wade, to whose efforts much praise is due.

Mr. W. Fleet Robertson, Provincial Mineralogist for British Columbia, reports great activity on the west coast of Vancouver Island and in the mining districts of the Queen Charlotte Islands group, where a number of new and promising copper properties are being opened up. At Rainy Hollow in the Atlin district several properties have been bonded to the representatives of British capital.

Mr. F. B. Vrooman, president of the British-American Dredging Company, operating in the Atlin district, B.C., has returned to London after spending some time inspecting the company's property on the Hootalinqua River. Mr. Vrooman stated in an interview that the company expected to have three dredges in operation next season, and that he had a high opinion of the gold dredging potentialities of this section.

Dr. W. G. Miller, Provincial Geologist; Mr. T. W. Gibson, Deputy Minister of Mines, and Mr. E. T. Corkill, Inspector of Mines, have returned from Deloro, in Hastings County, where they inspected the new smelting plant, now almost completed, of the Deloro Mining & Reduction Company. With this and other smelters now working, or nearing completion in the north country, the camp will soon be free from the American smelters.

Mr. E. T. Corkill, Inspector of Mines for the Province of Ontario, reported recently upon his return from a visit of inspection in Western sections of the Province that the Port Arthur blast furnaces, which have been in operation since June last, are now treating 150 tons of magnetite from Atikokan daily, while shipments will ere long be commenced from the Northern Pyrites Company's mine, north of Dinorwic. Mr. Corkill also states that prospecting for gold is active in the Sturgeon Lake district.

Mr. Frank G. Stevens, erstwhile in charge of properties in British Columbia and well known to many of our readers, has been for some time past general manager of the El Favor mine in Mexico. In a recent report to the directors of the company, Mr. Stevens states that operations have resulted in the development of positive ore reserves to the value of $7,439,440, while probable ore is valued at $8,841,740. Development work at the property last year yielded a result of opening up ore bodies to the gross value of $3,978,000.

The judges, Messrs. Hobart and Going, have recommended the Council of the Canadian Mining Institute to award prizes as follows to student members who presented papers at the last annual meeting of the Institute, namely: President's gold medal and prize of $25 to Mr. Frank E. Lathe, of McGill University, for his paper on "Basic Open Hearth Steel Manufacture as Carried Out by the Dominion Iron & Steel Company at Sydney, Cape Breton';; and prizes of $25 each to Messrs. W. J. Dick, of McGill University, and Mr. G. R. McLaren, of the School of Mining, Kingston, for their papers entitled respectively "The Caribou Consolidated Hydraulic Plant,

Bullion, B.C.," and "Underground Mining Methods at the Quincy Copper Mine, Michigan." Papers by Mr. C. V. Brennan and Mr. G. D. Drummond, both of McGill University, were also highly commended.

Mr. C. R. Devlin, representing Nicolet in the Federal House of Commons, has been invited by the Hon. Mr. Gouin, Premier of Quebec, to accept the portfolio of Mines, Colonization and Fisheries in his Government, in succession to Mr. Jean Prevost, who resigned recently. Mr. Devlin has been actively associated for some years past with public affairs, having been elected to Parliament first in 1906, later acting as Dominion immigration agent in Ireland, from which position he resigne to represent Galway in the Imperial House.

Mr. Geo. R. Naden, M.P.P., representing Greenwood in the British Columbia Legislature, has returned after spending the summer in the Telkwa district. Referring to the mining possibilities of this new field, Mr. Naden states that surface indications are most promising, and in the Bulkley valley, on the Babine range and elsewhere are large deposits of ore rivalling in size those of the Boundary district, while carrying higher values. Already much surface prospecting has been attempted, one company having expended over $50,000 this summer in work of that character; but actual and important progress is, of course, dependent on the completion of the railway.

Mr. J. B. Tyrrell has opened an office at 9 Toronto street, Toronto, Ont., where he will henceforward be open for engagement as consulting mining engineer. Mr. Tyrrell is a mining engineer of ripe experience, a professional man of the highest type. Our readers will remember recent articles of his written expressly for the JOURNAL. In one of these Mr. Tyrrell wrote of the evaluation of mining property, and it is in this department of mining and in practical economic geology and the examination of mineral deposits that Mr. Tyrrell has made his name. However, it need hardly be added that Mr. Tyrrell is well qualified in all the branches of his profession. Mr. Tyrrell graduated from Toronto University in 1880, since when he has been continuously engaged in geological and mining work.

At a meeting of the Council of the Canadian Mining Institute, on Saturday, October 5th, Mr. George R. Smith, the past president, and manager of Bell's Asbestos Company, was presented with a handsome silver tea service, purchased from a fund started on the occasion of the Institute's excursion to Cobalt in March last, and to which a number of members subscribed. Accompanying the gift was an address, appreciative of Mr. Smith's services to the Institute, and a list of subscribers. The presentation was made by the secretary. Several of the gentlemen present, including Dr. J. B. Porter (in the chair), Mr. Dresser, Mr. Hopper and Mr. Stevenson Brown also spoke in testimony of Mr. Smith's unfailing zeal in promoting the welfare of the Institute, not only during his term of office but since the incorporation of the Society, of which he was a charter member. In reply Mr. Smith said that while thanking the subscribers for this kind expression of good-will, he felt that the Institute had already honored him above his deserts in having elected him to the office of president for two successive years. This, he felt, was the highest honor and the greatest compliment the Institute could bestow to any member and nothing he had done nor could do in the future to help forward the work of the Institute would, in his estimation, offset the debt he owed the Institute for the honor they had done him in electing him to that office. The Institute, Mr. Smith added, had grown to be regarded as one of the most influential and important of our national institutions and one that was materially assisting in the development of the resources of the country. To be associated with such work was a privilege; to every mining man who had the interests of our Canadian industry at heart it should also be a duty.

Queen's University has conferred upon Mr. A. P. Low, Deputy Minister and Director of the Dominion Geological Survey, the honorary degree of LL.D. No person familiar with Mr. Low's brilliant work can doubt that he is one of the foremost living field geologists and explorers. His unique work in the sub-Arctics has marked him as a signally efficient explorer. As an administrator, although he has not recently enjoyed the best of health, Dr. Low has demonstrated that he has lost none of his virility and keen-sightedness.

CORRESPONDENCE.

To the Editor, CANADIAN MINING JOURNAL.

Dear Sir,—I have read your suggestions in regard to the Canadian Mining Institute in your issues of July 15th and August 1st, and also the letters in answer, which you have published since, from several members of the Institute. Permit me to congratulate you on the stand you have taken.

The questions raised by you, as you say in your issue of August 15th, are: Can the Institute be made more useful? Does the Institute, as a corporate entity, take as active a part in the mining affairs of the country as many of its members desire it should? If not, what are the remedies? All matters of personal feeling should not be allowed to effect these important questions in the slightest.

These questions, Mr. Editor, as a good many members of the Institute will remember, were raised by me at the meeting in Montreal in March, 1905, in my presidential address, in which I said, in part:—

"Could we not, all of us of the Canadian Mining Institute, the only incorporated Institute representing the mining men of the whole country, do more than we are doing to hasten a more rapid and healthy development and progress of this immense mineral wealth of Canada? I have no hesitation in saying yes, we can do much more and it is our duty to do it . . . We (the Institute) have done a great deal in the past, but we can do, and must do more in the future . . . In my opinion the time has come for the members of the Canadian Mining Institute to adopt such changes in the constitution and by-laws of the Institute as will conduce to these results."

These changes, I briefly stated in the same address to be, in my opinion:—

"(a) A larger representation of the members on the Board or Council of the Institute.

"(b) The formation of strong branches of the Institute in the different Provinces and in some of the important mining districts of the coutnry."

In support of these suggestions I went on in this address to show that, in the past, only a few members have been active in Canadian Mining Institute affairs, and that in future we should re-arrange matters in order

that a good many more members from all over the country would in some way join these few, and I added:—

"It will readily be seen that the above proposed changes or additions to our by-laws will accomplish this, not only by enabling more of us to meet in Council in Montreal, Toronto, and other places in the central parts of the country as often as necessary, but also by means of branches we shall be in constant communication and interchange of ideas with members residing in the outlying districts. These, in the meetings of their branches, which can be held several times a year if necessary, will bring up and discuss all the interesting subjects connected in any way with their local mining interests and industries, and their chairmen, secretaries and full organizations will always be in touch with the central organization. Thereby the necessary activity and life will run through the Canadian Mining Institute from the Yukon to Cape Breton, together with the necessary spirit of mutual help and unanimity of purpose, so essential to permanent achievements."

Then, at the end of the address, I gave at length the example of the Canadian Manufacturers' Association, which, as everyone knows, has been and is a most successful and powerful association, and which was and is conducted on the lines suggested, viz., a large executive board or council of 100 representatives from all parts of Canada, elected at the annual meetings on the per capita basis of one for every fifteen members, and with local branches organized in leading Canadian centres with authority, under the constitution and by-laws, to deal finally with any local question, while representations with regard to general questions are dealt with merely by recommendations which are forwarded to the Executive Council for final decision.

I was glad to see, Mr. Editor, that your influential paper, the official organ of the Canadian Mining Institute, is again attracting the attention of the members to these most important points to the mining community of this country, and that, to judge by the letters you have published (if we except the one of the Secretary, which would have been better left unwritten), prominent members of the Institute concur in your views.

Let the good work go on and let us have a broader, more lively and more powerful Canadian Mining Institute. In these days of rapid extension of our mining and metallurgical industries a greater Canadian Mining Institute will be most useful, and recent events have shown that it is also a necessity, in order that we may properly fulfil these portions of our mission as laid down in the charter of the Institute, viz.:—

"To take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada. To encourage and promote these industries by all lawful and honorable means."

Yours sincerely,

EUGENE COSTE.

SPECIAL CORRESPONDENCE

ALBERTA.

EDMONTON.—This month sees at Edmonton quite a revival in the coal trade. Numerous small mines which have been closed down for the summer months are now opening up. The methods of mining are very primitive, the majority of the mines being opened along the outcrops of the vorious seams. The typical mine consists of two tunnels driven level course in the coal from the bank of the Saskatchewan River. From on of these tunnels a small shaft is raised to act as an air shaft. Natural ventilation is employed to produce the small current of air necessary to keep the mine free from smoke. The mine timber is cut on the banks of the river in the vicinity of the mine, and as the roof is generally good very little timber is required. The Saskatchewan River is deep enough to allow the passage of shallow draught steamers, and these steamers are employed to tug the coal barges from the mines into Edmonton.

The method of screening the coal is very crude. A tipple of poplar poles is erected from the mine mouth to the edge of the river, and a chute constructed from the end of the tipple so that the coal when dumped from the mine cars runs by gravity over a short bar screen and into the waiting barge underneath.

In winter when the river freezes over sleighs take the place of barges, and haul the coal on the ice right into the heart of the city.

The seams being mined vary from 5 to 8 feet in thickness, and are high grade lignites. The coal makes a splendid domestic fuel and has also been used on locomotives with a fair measure of success.

Ten to fifteen men are employed in each mine, and the output rarely exceeds 50 tons per day.

Last winter it was estimated that 750 tons per day was being hauled from the various small mines.

Most of this was consumed in Edmonton, but a considerable quantity was also shipped to points east along the Canadian Northern Railway as far as Saskatoon.

The price realized for this coal is $4 per ton f.o.b. cars Edmonton. This is a very high price, but owing to the small primitive plants in use and the long haul into town and the necessary unloading from barges to wagons and from wagons to railway cars, the profit to the mine operator is not so large as it otherwise would be.

There is a splendid opening for a few large mining campanies to step in, sink shafts and erect modern plants alongside one of the three railways with which the Edmonton district is supplied.

BRITISH COLUMBIA.

THE KOOTENAYS.—The general situation here is very critical, as far as the metaliferous mines and the smelters are concerned. The prices of copper, especially, and of silver and lead have dropped to an extent that makes it a difficult matter to mine and ship our ores, contending, as we have to, with an extraordinarily high price for mine supplies and labor. Were it not for the very low charges that are in vogue here to-day for smelting and transportation, all of the copper mines, at least, would be closed down tight, and that would mean a shut-down of the smelters. As it is the mines and smelter of the Dominion Copper Company at Boundary Falls have just closed down. While these people were mining a low grade of copper ore their mining and smelting charges only ran somewhere around two dollars, or slightly under, per ton. While the very low price of copper was probably the chief reason for their cessation of operation, it is reasonable to suppose that other factors of the present general state of affairs had a hand in it. The stress here increases hourly, and we would not be a bit surprised to see other Boundary mines close down for a time, if conditions as they are at present continue to prevail. The Boundary ores are principally copper ores, while those shipped from Rossland are what are known as gold-copper ores, so it is expected that if any of the low grade properties can breast

the tide of hard times for a period it will be the Rossland mines, and the case is critical with them too.

The Consolidated Mines at Rossland are shipping about 3,500 tons of gold-copper ore per week, and have been doing active development work on the claims recently acquired. Some valuable ore has been located on the Idaho claim, adjoining the Centre Star, but this was not an unexpected development by any means, as the surface showing on the Idaho is an exceptional one for this district and the claim has shown up well wherever development work has been done on it.

Le Roi mine is shipping approximately 2,500 tons of ore per week to the smelter at Northport. Considerable development is being done, and they are still operating the diamond drill on the Spitzee Group, which they have under bond. Mr. Larson, superintendent, has returned from his holidays, and denies that there is any truth in the rumor that he may leave the LeRoi Company.

At the White Bear they have laid off a few of their small force. It was rumored that they had closed down, but Superintendent Demuth states that they will continue to operate for a while yet.

The everyday development is being pushed on the Giant-California properties and the Jumbo. These properties have some very good ore, of an altogether different nature from the Consolidated and Le Roi properties, and it is hoped that they will locate good bodies of it.

The supply of coke and other fuel is a little more plentiful now and the smelters are running along without any trouble.

The big saw mills of the district are nearly all closing down for the winter.

The coal mines along the Crow's Nest seem to be very busy. There is a great demand for their product, and it is stated that they will not be able to produce too much to supply the various demands this fall and winter.

On the property of the Alberta Coal & Coke Company near Lundbreck, Alberta, the cross-cut which they have been driving to cut five seams of coal has finally pierced these seams. The coal is said to be of a good hard quality, and the total width is about 75 feet. The output of the company is rather small at present, and is being supplied to local consumers. This company controls nearly 6,000 acres of coal land. They are employing about 30 men. There are some very rich zinc properties on Arrow Lake, which would be working now if the owners and American capital could get together. The owner of the principal property, a Northport man, has been offered $100,000 for his prospect, but is holding out for $400,000. The ledge is 400 feet wide, 300 feet of which will run 18 per cent. and 48 feet will average 40 per cent. zinc.

Work on the V. V. & E. Railway is being pushed westward, and a contract has been let for the blasting of a practically solid roadbed out of a perpendicular mountainside near Hedley. This will be quite an expensive and stuepndous piece of work.

Mr. W. Y. Williams, consulting engineer for the Granby Company, has just paid a visit to the Independence proposition on Bear Creek, in the Similkameen District, which the Granby people have under bond. It is stated that the company will keep a force of seven or eight men at work drifting on the ore body all winter.

The Similkameen is the coming mining district here. As soon as the railways are able to handle freight in that district we will begin to hear something of the rich mines they have there. The propositions now being opened up are mostly copper, but some of them are very rich in gold, for instance the mine near Hedley of the Daly Reduction Company, which runs very high in gold values. The placers of this district have not played out yet by any means, either. Most of the placer mining, however, is done now by Chinamen, the white prospectors busying themselves with the big lode mines. A Chinese miner on Old Granite Creek the other day picked up a $57 gold nugget. It is stated that frequent finds are made by these yellow miners of fair sized nuggets.

A very good coking coal is also found in the Similkameen district, and no doubt in the near future we can look to that section for a part of the coke and fuel supply of the Province.

GENERAL MINING NEWS

NOVA SCOTIA.

Glace Bay.—Since December 31st, 1893, the Dominion Coal Company has mined and sold 25,500,000 tons of coal. The labor for the mining the this coal has cost the company $22,000,000. It pays the Province of Nova Scotia a royalty of 12 1-2 per cent., as against 10 per cent. paid by all other coal mining companies. The total royalties thus paid out since 1893 amount to $3,154,500. It employs 5,000 men, as against 1,800 in 1893. It pays annually $2,996,400, as against $707,400 in 1893.

Westville.—On October 12th, in the Drummond coal mine, John P. McDonald, a miner, was struck by a loaded box and instantly killed.

Port Morien.—The North Atlantic Colliery Company shipped its first cargo of coal on October 17th. One hundred tons of fresh mined coal was sent by schooner to Newfoundland. A three-masted schooner is now loading 600 tons for Quebec. The daily output now is 150 tons. This will shortly be increased to 200 tons. One Ingersoll undercutting machine is used. Air is supplied by a Norwalk compressor of capacity of 30,000 cubic feet of air per minute. The pumps are run by compressed air. Deeps, levels and rooms are being thoroughly cleaned and retimbered. A new Babcock and Wilcox boiler is being installed and the old boilers arebeing cleaned and rebuilt. The water supply is to be taken from Sand Lake. The new smoke stack, 100 feet in height, has been placed in position. The new haulage rope is 14,000 feet long.

Springhill.—Negotiations have again fallen through, owing partly to the fact that Manager Cowans has refused to confer with the men and partly to the unwillingness of the men to abide by the findings of the Board of Arbitration. The officials of the company have been doing duty at the engines and pumps. The Pioneer Lodge, to which the workmen belong, is preparing for a long struggle.

ONTARIO.

Wabigoon.—The action brought by Harold A. Wiley against Anthony Blum for a $150,000 claim on the sale of the Laurentian mine, was dismissed without costs.

Port Arthur.—The West End and Beaver silver mines, the former of which has been producing for some time, are both looking well. At the latter one hundred and fifty sacks of high grade ore have been sacked from the old workings.

The shaft of the Wright zinc mine, north of Pearl River, is down 219 feet. The vein has been traced for 500 feet. It is 5 feet wide. Machinery is soon to be installed.

The Mining Recorder at Port Arthur reports that in the past six weeks 218 mining licenses were issued from his offices. For the current year a total of 298 have been issued. In the large number of mining claims filed the majority recently have been on discoveries of iron ore. Among these the large deposit of hematite at Long Lake is the most prominent. In Conmee Town-

ship deposits have recently been located. Gold claims have been filed at Sturgeon Lake and English River. The Tip Top copper region, soon to be opened up by a Government road, will become a substantial shipper. The East and West End Silver Mountain and the Beaver mines are in operation.

SAULT STE. MARIE.—A prospector named Michael has returned from Michipicoten Island with fine specimens of native copper and silver. If further prospecting gives satisfactory results a company with a small but sufficient capital will be organized.

COBALT.—The Arigiod mine has laid off all its employees except Superintendent Hoskin. It is rumored that the property is to be sold to the Jacobs.

On the 50 foot level of the Trethewey a six inch vein of native silver has been cut.

A royalty of $51,992 has been paid by the O'Brien Mining Company to the Ontario Government, being the amount due up to September 30th. Under the agreement the Government received 25 per cent. of the value of the ore mined, after certain handling charges have been deducted. The total amount of the royalties which this mine has contributed to the Provincial exchequer since December last is $222,745.

Seventy men are now employed by the Cobalt Lake Mining Company, as compared with forty-nine in July. Eight drills are running night and day.

The projected Kerr Lake branch of the T. & N. O. will probably be completed early in the coming year.

The main shaft of the Ruby Silver Mine has reached the 53 foot level. Drifting has been started on two veins.

The main shaft of the Green-Meehan is sunk to 114 feet. Drifting has been done at the 100 foot level. Two machines are being run double shift.

The Cobalt Concentrators have secured the contract from the Foster Cobalt Mining Company, Limited, to build a concentrator. The plant will be similar in process to that which is being erected on the Nipissing. The details of its capacity and site have yet to be arranged.

The Erie mine has suspended operations and the sale of the property is rumored.

The Coniagas Mines, Limited, in its appeal against income assessments levied by the Town of Cobalt, argues that, as it paid $4,000,000 for the mine, no income could be taxed until capital expenditure had been erturned by the product of the mine.

BRITISH COLUMBIA.

BOUNDARY.—In the past year the Great Northern and the C. P. R. have spent more than $100,000 in and around Phoenix camp in providing new spur lines, etc., for the large ore shippers. The new Rawhide spur cost about $20,000, and the Great Northern's spur to the Granby mines cost $100,000.

Contrary to newspaper reports, the White Bear mine has not been closed down. The report was due apparently to the laying off of six men.

Within the past year the higher price of coke, labor and cost of living generally has brought up the cost of producing copper very materially. Companies formerly producing copper at a cost of from 9 to 10 cents per pound cannot now bring their costs below 11 and 12 cents. When future developments of the coal fields of Alberta and British Columbia bring the price of coke down and make the supply more regular, the cost of copper producing will decrease. This is probably the only factor besides larger and more efficient plants that will tend to lower costs.

SIDNEY INLET.—The Indian Chief group of mines, belonging to the Vancouver Island Copper Company, has a promising bornite showing. The mine is being equipped with a 4,00 foot tram with a daily capacity of 500 tons. The tram goes directly down to the shore.

VANCOUVER.—W. D. Mathews, president of the Conosolidated Mining & Smelting Company of Canada, gave an interview on the condition of the Province. He stated that British Columbia, more than any other part of the Dominion, should be interested in having labor conditions which would enable capitalists to meet on equal terms on that line other section having the same natural resources; yet the conditions were exactly the opposite from those that should prevail. In the face of this fact there had been a depression in business along lines in which the Province was interested, making matters increasingly difficult. Silver had recently dropped 7 cents per ounce, lead had gone down $15 per ton, and copper was 12 cents below former quotations. The lumber business was also uncertain. Taking all these facts into account, there must shortly be a deadjustment of wages to meet the changed conditions, and the sooner this necessity was realized and accepted by all classes the better it would be for the future of the Province.

GRANBY.—The annual report of the Granby Consolidated Mining & Smelting Company includes the following financial statement:—

Assets—Cost of land, real estate, machinery, buildings, dwelling and equippment, $15,180,913.81; stocks, bonds and bills receivable, $895,674.69; fuel and store supplies, $130,536.88; cash and copper, $853,280.70. Total, $17,060,406.08.

Liabilities—Capital stock, $15,000,000; in the treasury, $1,500,000; issued stock, $13,13,500,000.00; dividends collected on liquidator shares, $883.67; accounts and bills payable, $783,764.76; surplus, $2,775,757.65. Total, $17,060,406.08.

The mine development is reported as 9,700 feet. Instead of the estimated 25,000,000 pounds of copper only 16,403,749 pounds were produced, 3,250,000 pounds less than the previous year. The net profits, however, were higher than previously, but not at all as large as might have been if the coke supply had been regular. The cost per pound of copper produced after deducting the value of gold and silver was 10.14 cents during the last year, as compared with 8.35 cents in the preceding year. The eight furnaces of the smelter are now in shape to handle more than 1,000,000 tons of ore per annum. This should mean a copper production of 30,000,000 pounds per year.

During last winter, when prices were high, the furnaces suffered from snow blockades and in the spring the fuel shortage hit them hard.

The sinking of the new Victoria three compartment shaft and the installation of an electric haulage system on the 400 foot level were among the year's most important new work completed.

Dividends during the year aggregated $1,620,000, represented by four quarterly disbursements of 2 per cent. and an extra dividend of 1 per cent. For the period ending June 30th there was a surplus of $2,775,757.

The company received an average price of 22 cents per pound for its copper. Its metal production included 257,378 ounces of silver and 35,083 ounces of gold.

Last year's directors, consisting of George F. Baker, Jr., George Crawford Clark, George Crawford Clark, Jr., Jay P. Graves, H. L. Higginson, B. Hochschild, Arthur C. James, J. Langeloth, George Martin Luther, William H. Nichols, W. H. Robinson, Sanford H. Steele, Edwin Thorne, A. L. White and Payne Whitney, were re-elected.

The officers elected were are follows:—J. Langeloth, president; Jay P. Graves, vice-president and general manager; George Martin Luther, vice-president; George Crawford Clark, Jr., vice-president, and Northrup Fowler, secretary.

The purchase by the Granby Company of a large interest in the Crow's Nest Pass Coal Company insures an adequate supply of coke for the future.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

Commenting on the recent meeting of the Iron and Steel Institute in Vienna, the *Iron and Coal Trades Journal* compares the conditions under which the iron industry is carried on to-day with those existing when the Institute was founded thirty-eight years ago. Then the total make of pig iron throughout the world was less than 12,000,000 tons, while the world's make of steel was not more than 250,000 tons. To-day the world's make of pig iron is over 60,000,000 tons, while the total steel output is probably not less than 45,000,000 tons. Since its inception the Iron and Steel Institute has materially assisted in giving a general impulse to the introduction of new methods, new processes, new appliances, and more economical systems, and through these, our contemporary points out, the expansion reflected in the figures quoted has largely been brought about.

In an address to the National Association of Colliery Managers, the president, Mr. G. H. Winstanley, F.G.S., referring to the institution by the King of a "kind of mining Victoria Cross," said that it was of course the duty of colliery managers to make it very difficult, by increasing the element of safety in mines, for that doceration to be attained. Meanwhile official statistics of mining progress show that very remarkable and gratifying improvement in the general safety of British mines. Fifty years ago the proportion of lives lost annually was one in about every two hundred and fifty employed in and about mines. The average for the last ten years has been about one anually in every seven or eight hundred employed. And whereas from explosions, one life in every thousand employed was the average fifty years ago; the average at the present time is only one in nearly forty thousand.

The make of pig iron in the United Kingdom for the half year ending June 30th, 1907, was 5,194,731 tons, as compared with an output of 4,905,424 tons for the corresponding period of 1906, and with an output of 4,621,600 for the first half of 1905.

AUSTRIA.

Among resolutions passed by the Miners' International Congress, we note the following: That the employment of children under fourteen in the mining industry and of persons under sixteen underground should be prohibited by legal enactment; that female labor in mines should be prohibited; that a pension be paid miners after twenty-five years' work in the mines; that the principle of a minimum rate of wages be generally applied. The representation at the Congress included 58 delegates from Great Britain, 2 from the United States, 17 from Germany, 19 from Austria, 10 from Belgium and 6 from France.

BELGIUM.

The output of pig iron from Belgium blast furnaces during the eight months of the present year is 950,640 tons, or a slight increase over last year's returns for the same period.

FRANCE.

The eight-hour working day in mines is a bill providing for which has passed the popular assembly, has yet to be approved by the French Senate, and there is good reason to believe that the proposal will there meet with considerable opposition.

UNITED STATES.

According to figures compiled by the *Mining World* (Chicago), one hundred and twelve metal mines and works in the United States distributed profits during the nine months of the present year, ending with September, aggregating the considerable total of $71,944,260. Our contemporary affirms that since incorporation these properties have paid $546,885,672 in dividends on an issued capitalization of $604,318,405, or nearly ninety per cent. These returns do not include dividends declared by the Amalgamated Copper, Copper Range Consolidated and other large corporations deriving profits from shares held in mines and metallurgical works.

In September five mines in the Coeur D'Alene district, Idaho, paid dividends aggregating $811,000, making the total distribution of profits for the year $4,559,500. A new and important discovery of galena is reported to have been made on the Vienna-International mine.

The State Geologist of Indiana reports renewed interest in the iron industry of that State. At Gary a number of blast furnaces are being constructed, at which point cheap fuel is obtainable.

The report of the Camp Bird, Limited (Colorado), just issued, shows earnings of £176,681, out of which two interim dividends, each amounting to £102,500, were paid. The net value of the ore reserves is placed at £703,525.

The output of the Montana copper mines has been reduced to 40 per cent. of the normal production, the smaller and independent concerns having also been forced to curtail shipments, the smelters having declined to treat their ore.

The United States Steel Corporation has decided to adopt the Koppers system of coke ovens on a large scale, and several thousands of these ovens, of the latest regenerator construction, are to be built in connection with the large new steel works to be erected at Chicago and elsewhere. The special features of the Kopper oven are: The distribution of the heating combined with easy means for regulation; the accessibility of all parts of the construction for inspection; and the large output of coke, by-products, and surplus combustible gas.

The Corporation has also, despite the less favorable prospects of the market, enlarged the scope of its plant for building a steel plant at Duluth; and instead of a plant comprising one 500 ton blast furnace, the furnace plant will have two furnaces, and the steel plant and finishing mills will be correspondingly larger.

Butte, Mont.—Oliver Crane, Master in Chancery, who heard the testimony of the famous smoke case, wherein it is sought to close the Washoe smelter of the Amalgamated Copper Company, has announced a draft of his findings of fact and set October 25th as the date on which he will hear objections to them and make final settlement. Upon the operation of the settlement depends the running of all the mines with the exception of several Clark properties.

JAMAICA.

The United States Consul at Kingston reports that promising copper areas have been acquired and being worked by American interests near Clarendon.

MEXICO.

Operations at the Greene-Cananea mine have been curtailed in consequence of copper market conditions.

AUSTRALASIA.

The report of the Department of Mines of Victoria for 1906 has recently been issued. The gold output of the State for the year is given as 772,290 ounces, the chief producing fields being: Bendigo, 221,187 crude ounces; Ballarat, 164,065 crude ounces; Beechworth, 134,812 crude ounces; Castlemaine, 99,386 crude ounces; Gippsland, 97,180 crude ounces; and Maryborough, 80,-267 crude ounces. The number of men engaged in the industry were 25,304.

Dividends paid by Western Australia mines during the first seven months of 1907 aggregated £1,031,084. All reports from this State are most satisfactory and an exceptionally good year's results are anticipated.

YUKON TERRITORY.

W ITE HORSE.—Extensive ledges of copper-bearing rock have been discovered this season at the mouth of Williams Creek, between Dawson City and White Horse. A settlement namer Bornite City has sprung up.

SOUTH AFRICA.

According to the official report on the mining industry of Natal in 1906, the output of coal in the year was 1,238,713 tons, or an increase of 109,306 over 1905. The colony possesses 24 productive collieries, employing 6,557 persons. The establishment of iron and steel works in the Vryheid district is arranged for, iron ore deposits of good quality having been discovered to the north-east of Holblane Mountain.

It is estimated that the new tax imposed by the Cape Assembly on diamond and copper companies will yield the Government a revenue of £360,000 per annum.

A deposit of cinnabar, occurring in a zone of sandstones associated with quartz and quartzites, which can be traced for some miles on the strike has been discovered west of Hector's Spruit on the Delogoa Bay line. The ore is said to average from 6 to 7 per cent. and it is proposed to treat it by the Elmore process.

South Rhodesia gold production to the end of July reached 2,335,573 ounces.

STATISTICS AND RETURNS

Following are the ore shipments and smelter receipts in South-eastern British Columbia district for the week ending October 19th and year to date, in tons:—

Shipments—	Week.	Year.
Boundary	33,989	1,017,802
Rossland	6,938	218,570
East of Columbia River	5,940	119,515
Totals	46,867	1,355,887
Smelter receipts—		
Grand Forks	21,966	551,660
Greenwood	6,809	276,169
Boundary Falls	3,185	158,394
Trail	6,582	197,796
Nelson	.....	11,340
Northport	2,938	77,826
Marysville	600	25,200
Totals	42,080	1,298,385

Cobalt shipments for week ending October 19th were:—La Rose, 5 cars, 141 tons; McKinley-Darragh, 4 cars, 132 tons; O'Brien, 1 car, 32 tons; Drummond, 1 car, 32 tons; Kerr Lake, 1 car, 40 tons. McKinley sent 1 car to Perth Amboy, 3 to Denver, 3 to Toronto; O'Brien, 1 to Deloro; Drummond, 1 to Perth Amboy. Kerr Lake, 1 to Perth Amboy. The total is 368 tons, of which 131 tons, or over one-third, were sent to the Denver smelters.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending October 18th was 24,133 tons; daily average, 4,022 tons.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending October 11 was 19,612 tons, a daily average of 3,268 tons.

The production of gold at the Rand in September is officially announced at £2,284,425. The out-turn in August was 555,037 fine ounces, and in September last year 505,111 fine ounces.

The following table gives the output of gold at the Rand (in fine ounces) for a series of years:—

	1907.	1906.	1905.
January	537,638	428,638	369,258
February	493,542	407,668	363,811
March	538,497	443,723	399,823
April	537,019	439,243	399,166
May	524,477	461,202	416,395
June	507,559	475,975	412,317
July	532,711	491,793	419,505
August	555,037	509,115	428,581
September	538,034	505,111	416,487

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Oct. 12 Ore in lbs.	Since Jan. 1 Ore in lbs.
Buffalo	60,000	1,998,830
La Rose	87,000	1,316,852
McKinley-Darragh	144,720	504,980
Nipissing	61,010	4,151,301
Townsite	42,000	192,078

The total shipments for the week were 394,730 pounds, or 197 tons.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Oct. 19 Ore in lbs.	Since Jan. 1 Ore in lbs.
Drummond	64,830	108,920
Kerr Lake (Jacoubs)	59,950	433,730
La Rose	281,710	1,598,562
McKinley-Darragh	266,260	771,240
O'Brien	64,575	2,345,580

The total shipments for the week were 737,325 pounds, or 368 tons. The total shipments since Jan. 1, 1907, are now 20,087,875

pounds, or 10,043 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2,144 tons, valued at $1,473,196; in 1906, 5,129 tons, valued at $3,900,000.

New Dividends.

The International Coal & Coke Company have declared a dividend of two per cent. on all outstanding stock in their books on October 20th, to be paid in Spokane on November 1st.

Commercial Items

The Canadian Rand Company, Limited, of Montreal, have opened up a show room at 11 St. Nicholas street, where they display a complete line of air compressors, rock drills and Imperial pneumatic tools. A small stock of repair parts will also be carried in stock for the convenience of local customers. This is the only place in Montreal where such a stock is displayed, and it should add impetus to the already immense sale of Rand mining machinery.

The J. R. Alsing Company, 136 Liberty street, New York, founded in 1869, and organized under the laws of the State of New York, have changed their name to the J. R. Alsing Engineering Company under the laws of the State of New York, and increased their capital stock from $20,000 to $100,000. The officers will be the same as in the old company. The enormous increase in their business made them make the above change.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.

Antimony—10 1-4 to 12 cents per lb.

Arsenic, white—7 3-8 to 7 3-4 cents per lb.

Barytes, crude—$18 to $20 per short ton.

Bismuth, metal—$1.75 per lb.

Cadmium, metal—$1.50 per lb.

Carbons for drills—$70 to $80 per carat.

Carborundum, powdered—8 cents per lb.

Chromium, metal pure—80 cents per lb.

Cobalt, f.o.b. Cobalt, Ont., unrefined—30 to 40 cents per lb.

Corundum—7 to 10 cents per lb.

Feldspar, ground—$14 per short ton.

Flourspar, lump—$8 to $14 per long ton.

Graphite, domestic—$50 to $150 per ton.

Gypsum, lump—$7 per short ton.

Infusorial earth, ground—$20 to $45 per long ton.

Lead—4.75 cents per lb.

Manganese, pure metal—75 cents per lb.

Mica, ground—$50 to $80 per short ton.

Mica, scrap—$10 to $15 per short ton.

Molybdenum, pure—$1.70 per lb.

Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.

Nickel, metal—45 to 65 cents per lb.

Platinum, ordinary metal—$27.50 per ounce.

Platinum, scrap—$22 per ounce.

Pyrite—10 to 11 1-2 cents per unit for 38 to 45 per cent. sulphur, lump ore or fines.

Quicksilver—$40.50 per 75 lb. flask.

Sulphur—$19 to $23 per long ton.

Talc—$15 to $25 per short ton.

Tungsten, pure metal—$1.30 per lb.

Tungsten, ore, 60 per cent. pure—$9 per unit.

Tin—31 1-2 cents per lb.

MARKET NOTES.

Silver.—October 3rd, 66 1-2; October 4th, 66 1-2; October 5th, 66; October 7th, 65 1-4; October 8th, 65; October 9th, 64 7-8; October 10th, 63 5-8; October 11th, 63 1-4; October 12th, 62 3-8; October 14th, 60 3-8; October 15th, 61 1-4; October 16th, 61 1-4.

Mexican dollars, 47 5-8 cents.

Sterling exchange, $4.8635.

Pig Iron.—Pittsburg, Bessemer pig, $22; No. 1 foundry, $21.50; No. 2, $21.

Iron Ore.—Bessemer, old range, $5; Bessemer Mesabi, $4.75; non-Bessemer, $4.30; silicious non-Bessemer, $2.50.

Spelter.—Market steady. New York, 5.50 cents per pound; London, £21 15s.

Lead.—Market weak. New York, 4.75 cents per pound; London, £18 5s. for Spanish.

Tin.—Tin has dropped seriously. New York, 31 1-2 cents per pound; London, £138 10s. for spot.

Copper.—No improvement in the market. New York, lake, 13 1-2 cents per pound; electrolytic, 13; London, £60 for spot.

On October 16th the London price of bar silver reached the lowest point since August, 1906. At that time it was quoted at 27 1-4d. The closing of the Mexican mints to the free coinage of silver caused a decline of bar silver to 25 7-16d. in April, 1905. The continued buying of the Indian Government brought up the price to 30 5-16d. in December, 1905.

The Government of New Zealand is now offering a bonus on the production of marketable copper from ores mined and smelted in the country; and a bonus of four pence a pound on the production of the first hundred thousand pounds of quicksilver, free from impurities, from any New Zealand mine. In respect to copper, the conditions are that if 1,000 tons are produced on or before June 30th, 1909, the bonus payable will be £1,000; after that date, £500 will be paid on respectively the second and third thousand tons produced.

At the congress of miners of the centre of France, held recently at Commentry, one of the questions discussed was what attitude should miners assume in the event of war being declared. Finally a resolution to the following effect was passed: "The National Federation of the Miners of France ought to respond to a declaration of war by a general strike." This in no wise discounts some of the unpatriotic utterances of certain anarchistic delegates to a labor convention at Winnipeg.

According to a report of a commercial agent of the United States Government, Afganistan is an extraordinarily rich mineral country. It is known to have mines of rubies, topaz, lapis lazuli, marble, iron, lead, copper, antimony, and other metallic ores, as well as sulphur and several of the earthly alkaline and metallic salts. Coal is also found. The lead, iron and precious stone mines are partially worked by the Government with modern machinery, but the mining of the country is mostly carried on by the crudest of methods and the bulk of the mineral wealth is not yet touched. The Amir continues to gradually purchase mining machinery as he has funds; but both Government and people are opposed to granting any concessions to foreigners.

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The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

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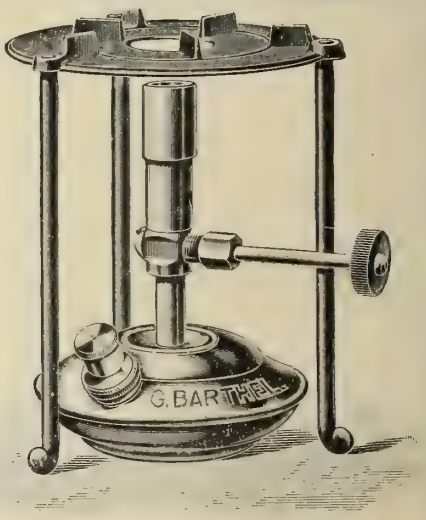
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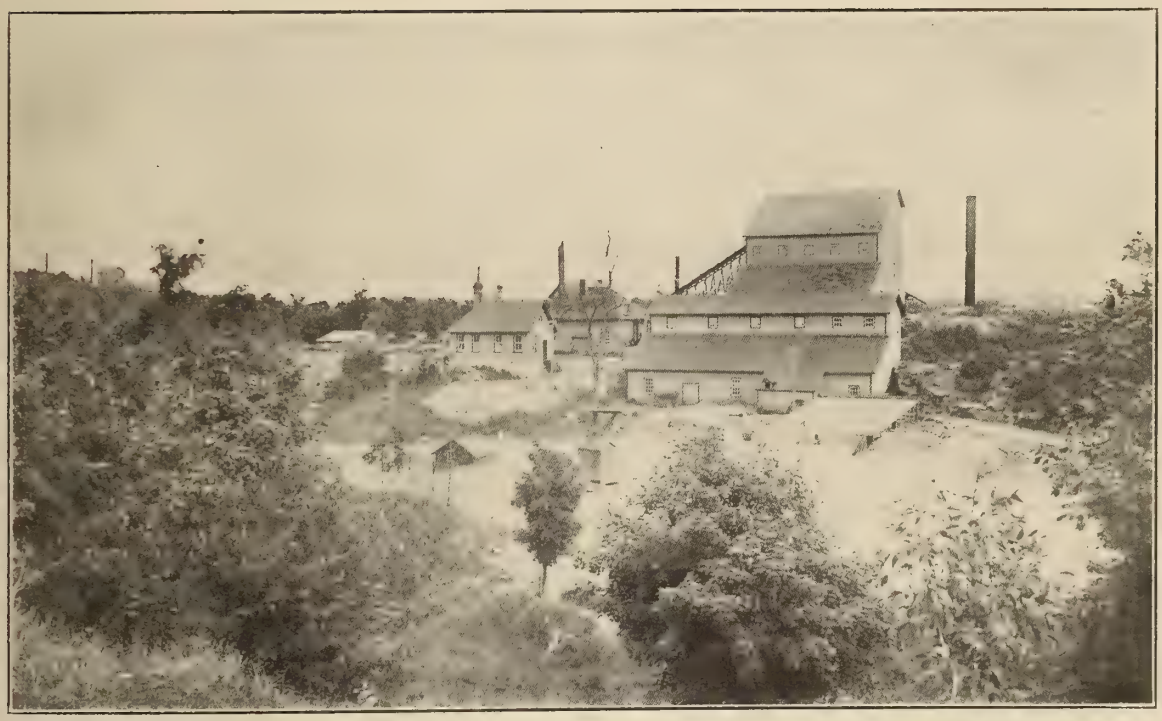
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L. I. No. 17 New Series TORONTO and MONTREAL Old Series, Volume xxviii. No. 19



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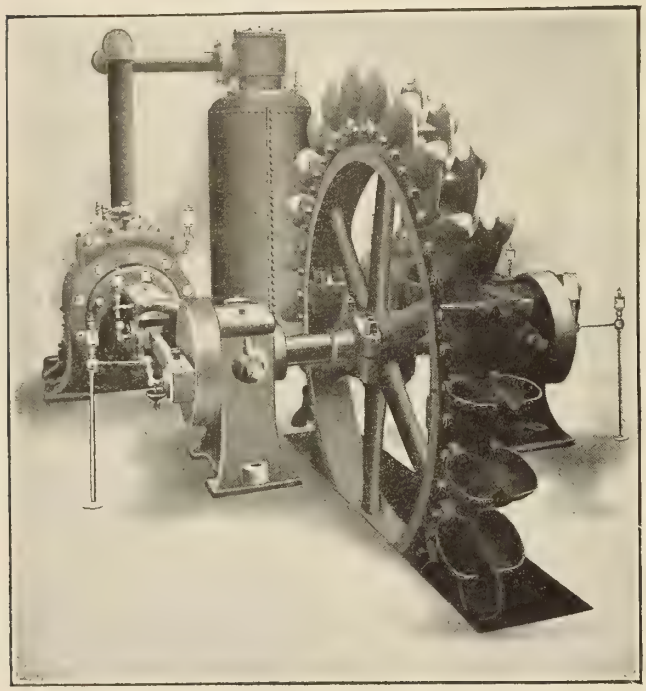
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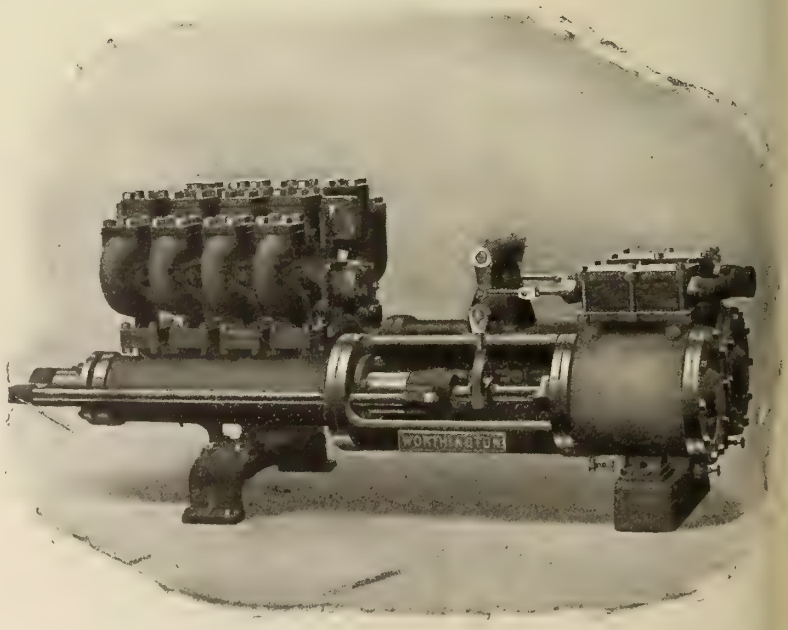
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The Mineral Province of Canada

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$24,980,546

The Tonnage of Ore mined in 1906 was 1,963,872 tons. The Gold Production in 1906 was $5,579,039 the Lead Output 52, 408,217 lb., and the Copper 42,990,488 lb.

Lode Mining has only been in progress for about 14 years, and not 20 per cent. of the mineral land has been even prospected; 300,000 square miles of unexplored mineral-bearing land are open for prospecting.

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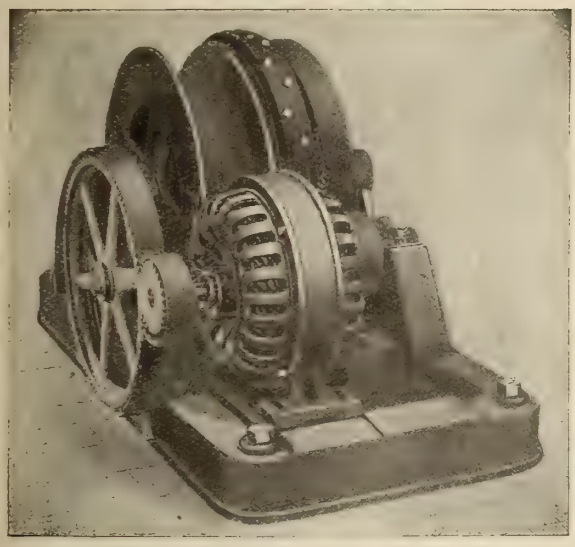
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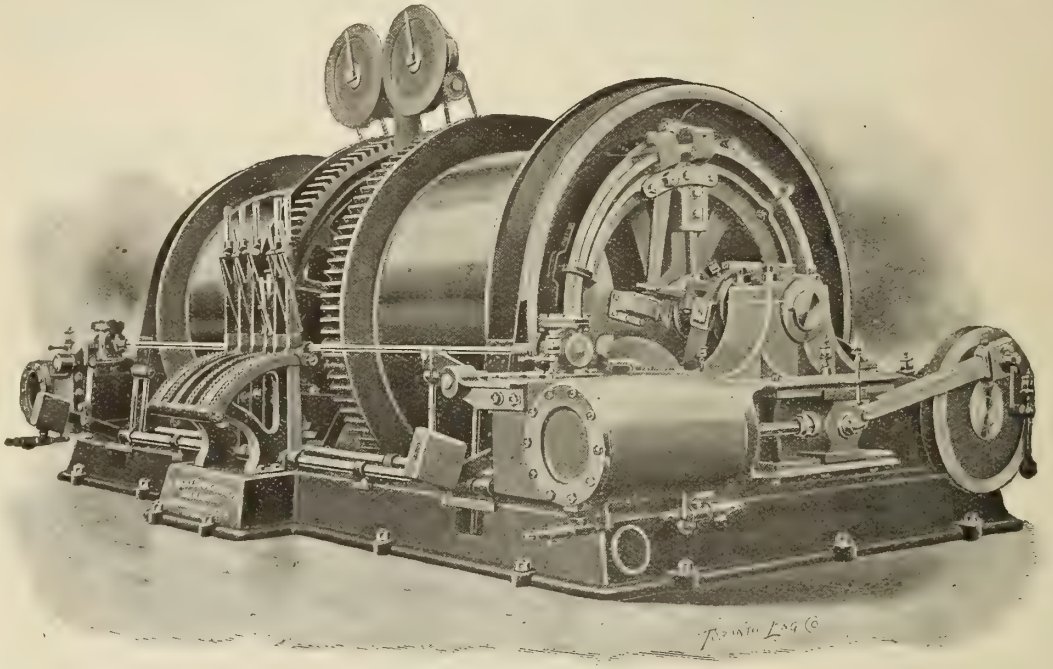
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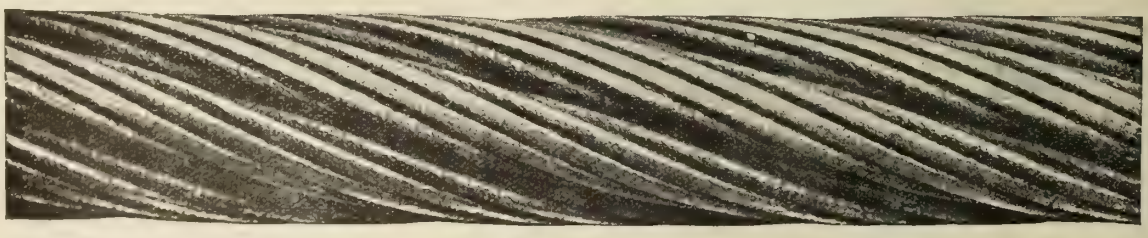


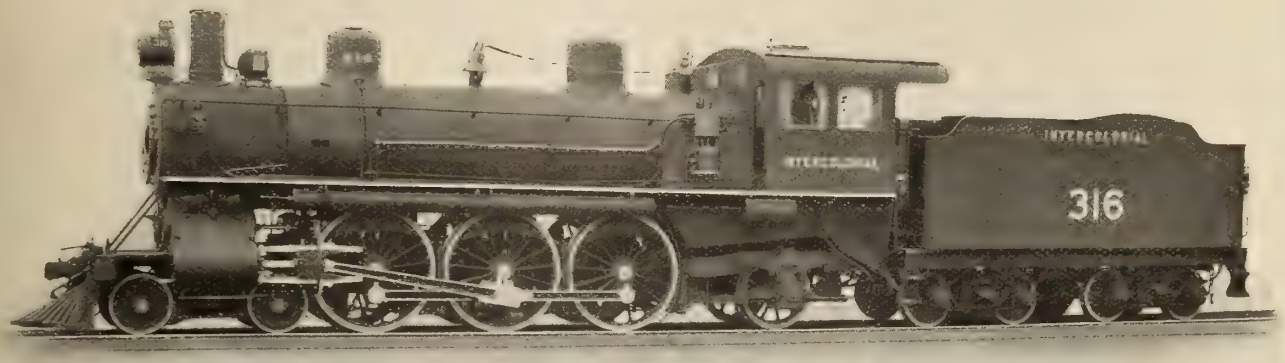
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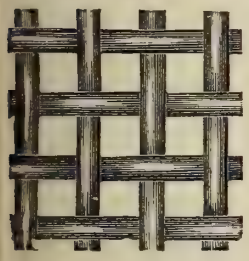
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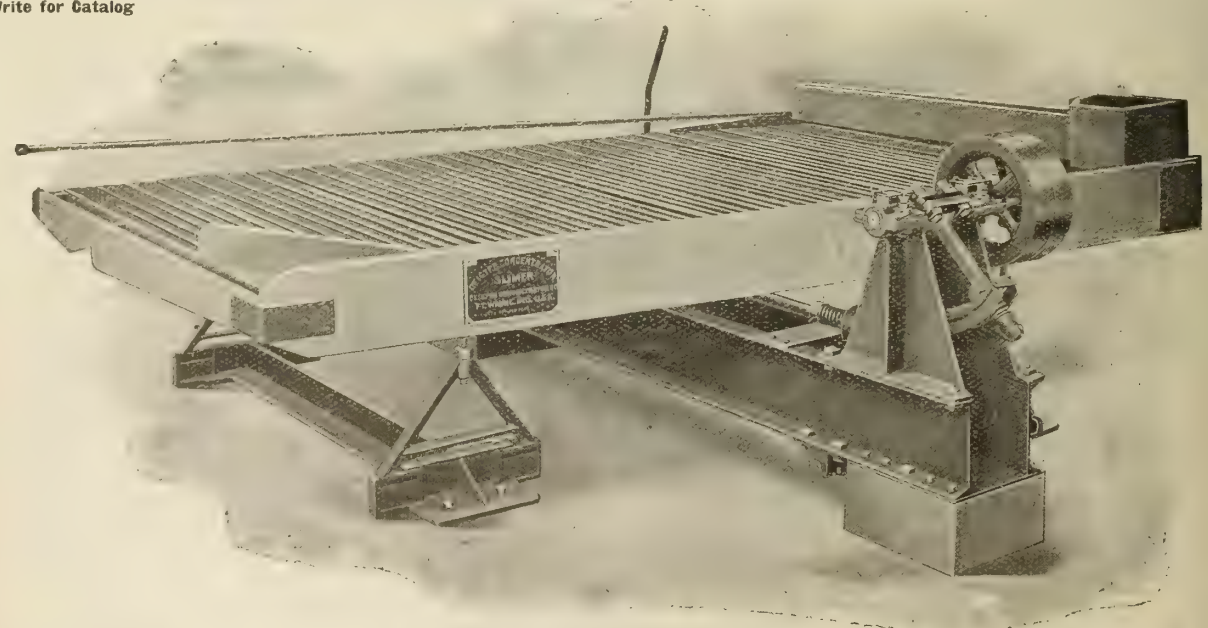
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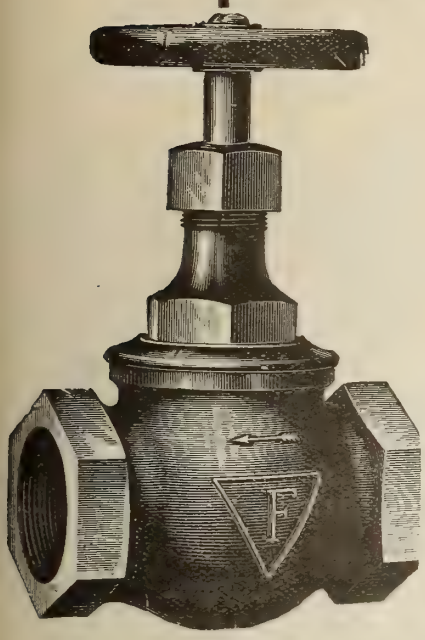
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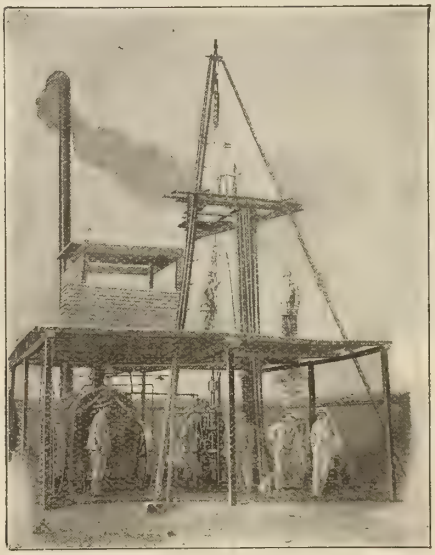
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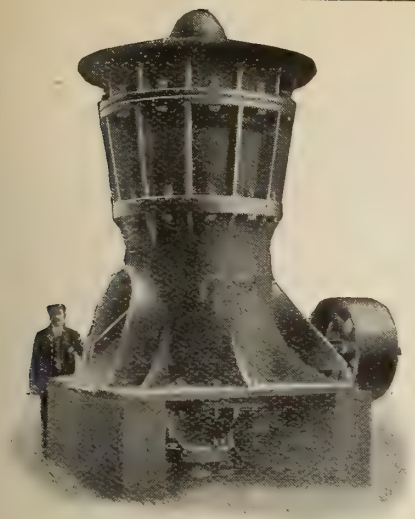
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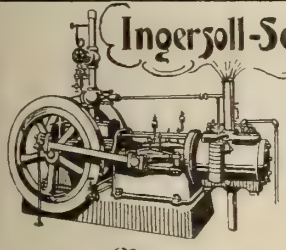
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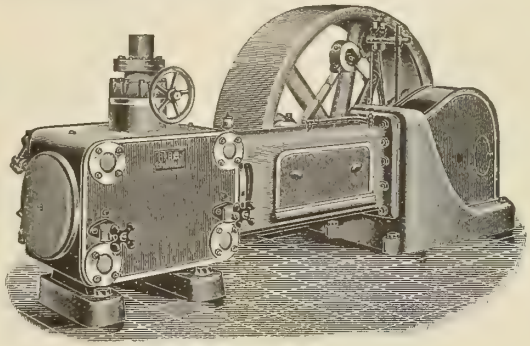
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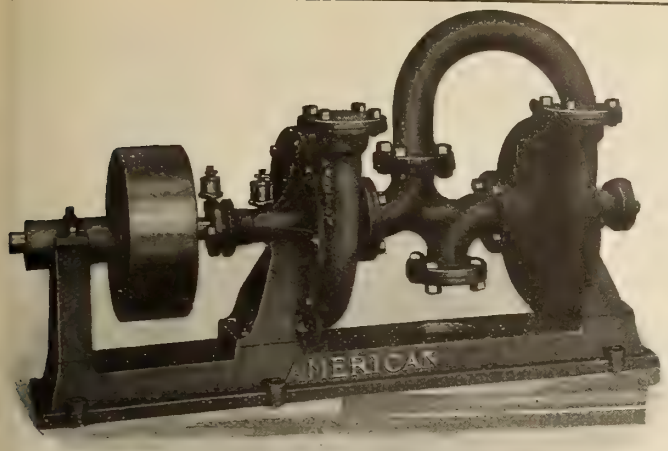
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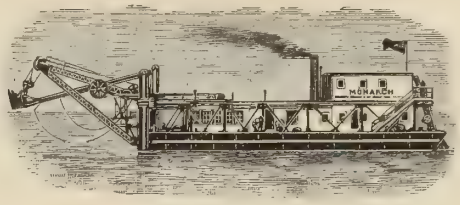
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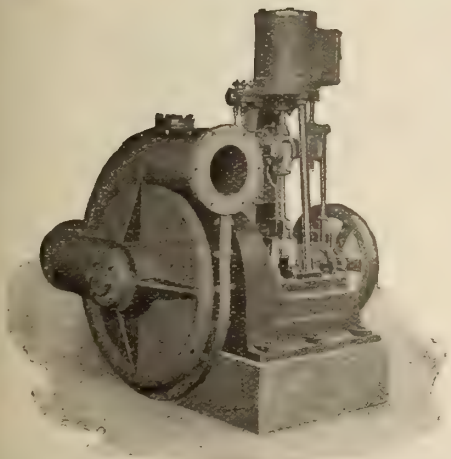
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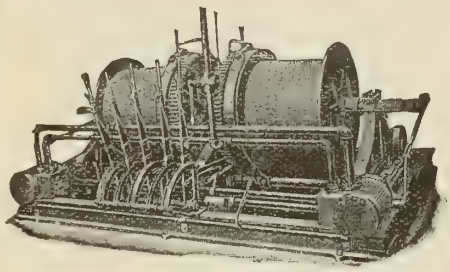
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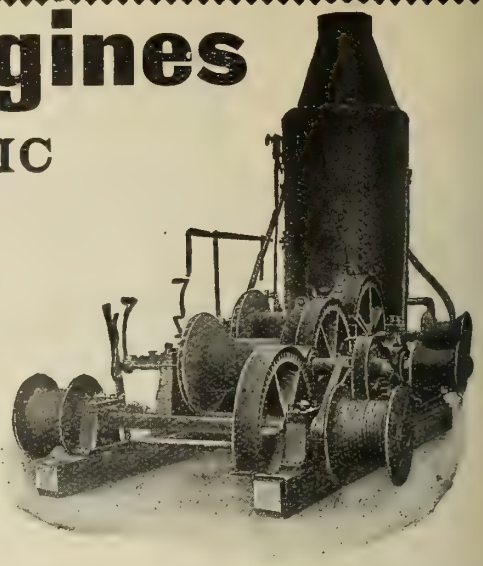
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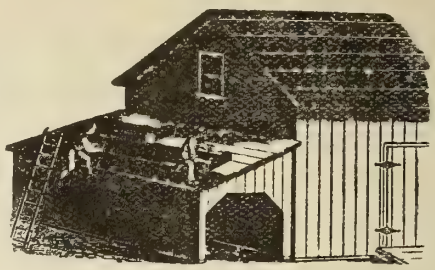
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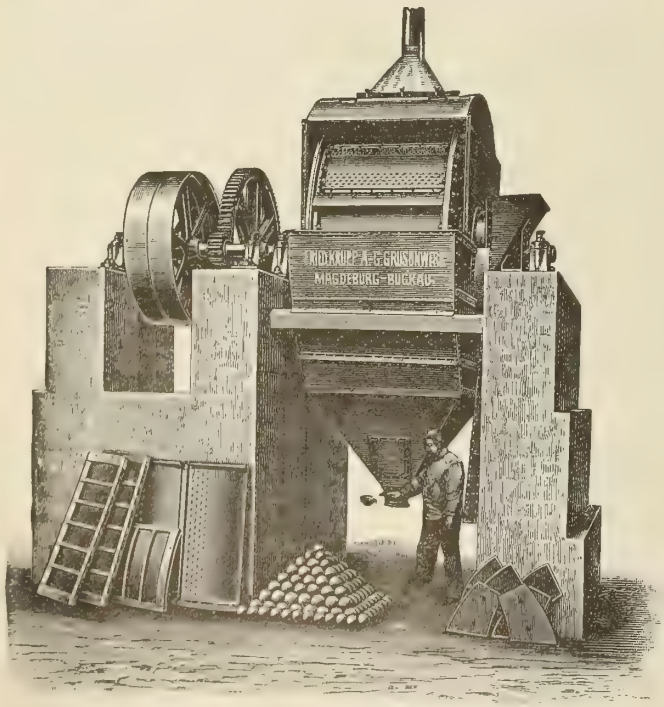
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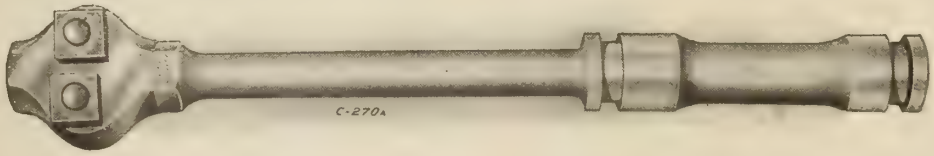
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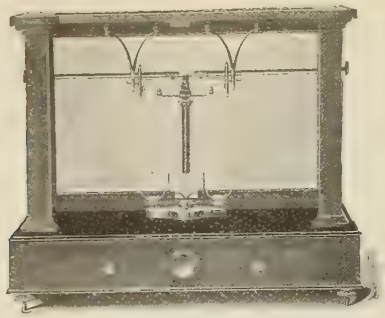


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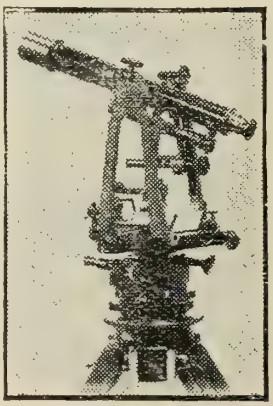
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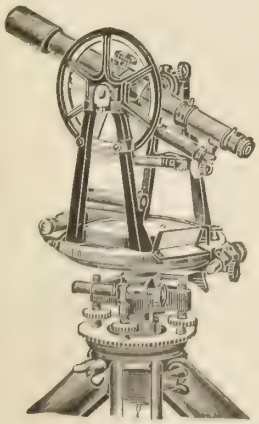
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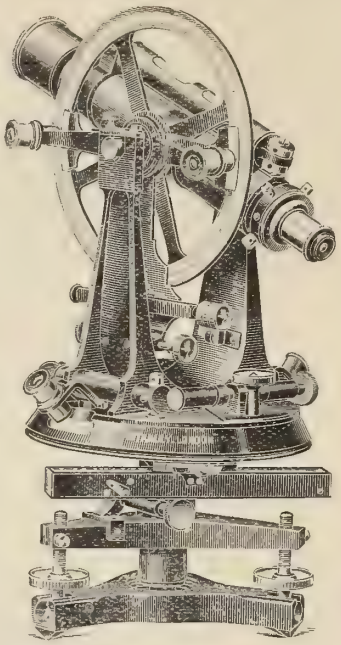
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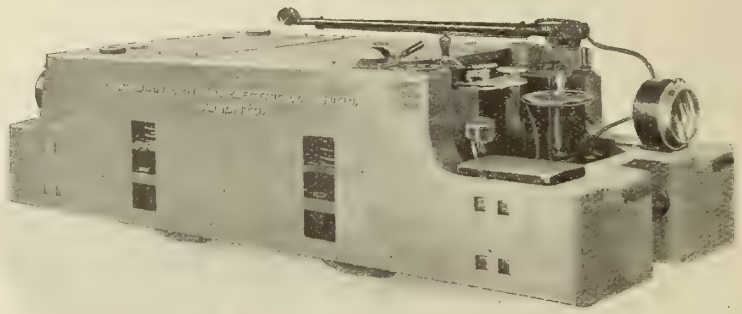
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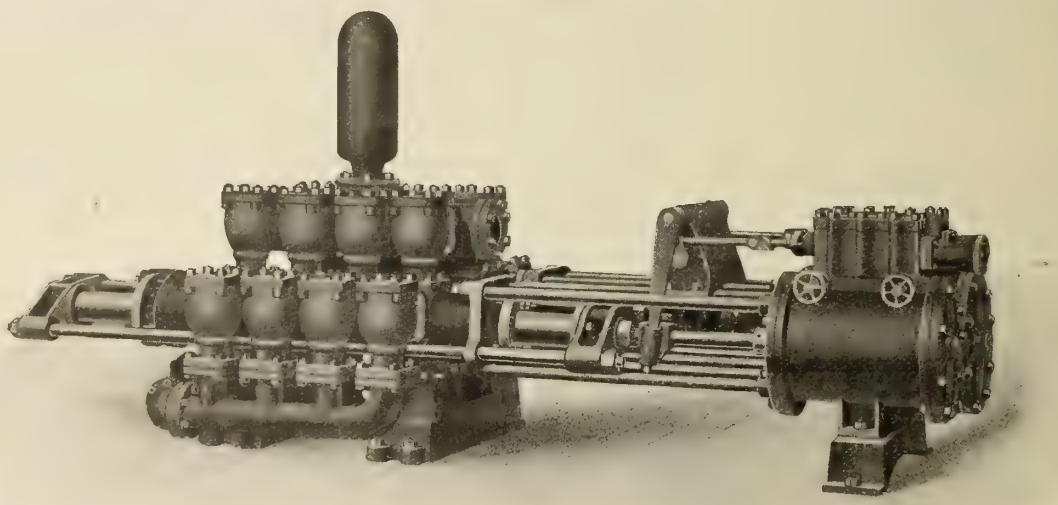
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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol School of Mining, Kingston, Ontario.

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ENGLISH AS SHE IS WROTE.

Though it has been pretty well known for some months past that the Geological Survey of Canada intended publishing a monograph on Niagara Falls, whispers have lately circulated in scientific circles that the report was held up on account of differences between the author and those in authority as to the merits of the work.

A very short synopsis of the report has been published, by the author, Dr. J. W. Spencer, in the October issue of the Geological Magazine, and if it be a sample of the work submitted to the Geological Survey, surprise at its non-appearance will be small compared to curiosity as to the statements it upholds.

The two pages referred to contain a few opinions regarding Niagara Falls and a great many opinions regarding Dr. Spencer's connection with them. Nature and the Almighty have, it seems, had very little to do with the Falls themselves, for Dr. Spencer nobly assumes full responsibility. The doctor tells us in, practically, the only grammatical sentence included in the two pages, that "Almost all the physical changes in the history of Niagara Falls have been made by me, at different times." It is a large and comprehensive statement; it is a statement that upsets some of our choicest geological theories; it is a statement that makes us despise most of what we absorbed in our Science course, but we believe the doctor—though thousands wouldn't.

Hard must it press, however, on the staid and solid Survey to accept the doctor's personal interference with poor Niagara; easy for all to understand the reluctance to give it publicity.

If the powerful professor whose almighty arm, as the hymn says, has played such havoc with the topography of this Province, had stated the rest of his premisses in grammatical English the Geological Survey might have doubted, but could never have misunderstood, his claims. A genius, however, is seldom a cosmopolitan genius, if one may use the term, and the difference the professor has made in our Falls is scarcely inferior to the indifference with which he treats our Mother tongue. What, indeed, is mood compared to metamorphism, and why should tenses trouble when terraces attract? Why indeed? They shouldn't, and they don't. Is it to be presumed that the professor—wielding a power almost creative—is likely to be trammelled by grammatical conventions? The man in the street may foster the belief that what is written is intended to be understood, but he fails to appreciate the triple advantage of Dr. Spencer's prose—it may mean anything at all, or nothing at all, or something quite different, and is naturally worth three times the money.

Joking apart, however, it is really sad to see one of our Canadian writers hold himself up to ridicule in an English magazine, and we look forward with some interest and a large amount of apprehension to the coming publication of the Geological Survey.

A VISIT TO LARDER LAKE.

A visit to Larder Lake is education—rapidly and comprehensively education. Heaslip, an inhospitably small station on the T. & N. O., is the starting point for what is probably the better trail of the two. At Boston the other trail begins.

After a good frost one walks from Heaslip to Tomstown, three miles, over a well-laid and level road. From Tomstown to Wendigo, where the alternative of a canoe route is offered in summer, the first few miles are execrable in soft weather, passable in frosty weather, and must be delightful after the snow flies. Settlers, mostly Englishmen, have taken up small farms along the road. The soil, slayey or gravely, as one may choose, is remarkably fertile.

Wendigo, seven miles on, we found in a state of interseasonal quiet. Long rows of canoes (we counted forty at least) were stacked in frames for winter storage. We were told that already the smaller lakes were frozen over and that one sharp night would close the whole route to Larder. A water power of not inconsiderable dimensions exists here.

The trail from Wendigo to Tremblay's (Half-way House) is, for the most part, over clean gravel ridges. The walking, even when the rains descend (and descend upon us they did) is excellent.

From Wendigo on to Fitzpatrick's Bay on Larder Lake the road measures eight or nine long, heavy miles. From the bay a paddle of four miles takes one to Larder City.

For reasons various and apparent Larder City is sitting on her heels. Transportation is almost out of the question and will be until snow comes. The only symptom of mining near the "City" is to be seen on the Harris-Maxwell claims. The lake shore is dotted with empty camps, prospecting shafts and test pits.

Larder Lake is a deep and unquiet body of water. In its cold waters the lusty lake trout, the predatory pike, the piratical pickerel, multiply surprisingly. These hardy fish are firm of flesh and make sweet eating. Of wild duck we saw many. Through the long trails over the hills we disturbed dozens of partridge.

We also came upon signs of certain beasts of prey. The track of the wild cat was not hard to read. Winter-staked claims, discovery posts cunningly hidden by ambiguous legends on the corner posts or placed merely on an outcrop of country rock, or not placed at all, these are signs which he who runs may read.

There are two errors that obsess the average prospector in the Larder Lake district. The first is that quartz, of itself, constitutes a valuable discovery. The second is that a vein or dike must improve to the deep—usually in a geometric ratio. Neither conclusion is sound; indeed both are baseless.

All generalizations regarding mineral deposits should be received with a full appreciation of possible exceptions.

Whilst it is true that Larder Lake is yet far from being a proved mining district, we have not and we do not make this statement with the intention of injuring the district. Incalculable harm has been done already by newspaper advertisements and reading notices. A totally false impression has been created in the public mind. It has been announced that the district is an enormously rich one. This is false. But brokers and promoters have used the daily papers all over Canada to create this impression and, with the help of the various champions of the people, they have obtained money from thousands of poor folk under false pretences. A little common business sense upon the part of the daily newspapers would have obviated this. The least investigation would have elicited the truth about Larder Lake. But investigation was not made and the readers and subscribers of our powerful dailies find themselves betrayed.

Of the thousands of dollars subscribed by the public to develop Larder Lake mining claims by far the greater part has been divided between the newspapers and the promoters. This is a cold, irrefutable fact.

It is obvious that in common justice the newspapers must be held as parties to the crime. They constituted the only medium through which the promoters could appeal to the public. Had they denied the use of their columns to the wild catters Larder Lake might now have been a thriving camp, producing gold bricks instead of tragedies.

The end is not yet. When the story of fraud, waste, theft and incompetence is complete we believe that Toronto newspapers will revise their code of morals. No logic can justify a participation in the fruits of knavery.

This, however, is a digression. We feel strongly upon the subject.

We wish to conclude with an expression of opinion as to the present and future of Larder Lake.

What Larder needs, more than anything else, is a group of strong, competent mining engineers who will be free alike from the pernicious influence of promoters and from the hampering interference of directors.

Up to the present there has been (with one or two notable exceptions) no evidence of clean, intelligent mining. Stores have been wasted. Machinery has been transported over summer roads at paralyzing cost. Materials of construction have been ordered at any price and with no reference to the especial needs of the mining property. Much of this has arisen from the fact that wild cat companies do not care to employ reputable professional men.

The above is not true, we are glad to add, of several mining properties in Larder Lake. There are honest companies whose mistakes are mistakes of ignorance. But not more than two or three have settled down to an honest attempt to develop a mine.

All available facts indicate that Larder Lake, if it survives, will become a low grade camp. What this means very few people appreciate. For one thing it implies the careful expenditure of large sums of money, first in exploring the ore bodies and then in erecting commensurately extensive plants. These steps will take at least three years. Not before many years more have elapsed can dividends be expected, if dividends there are to be. Over and above all the district needs experienced, careful mining engineers who will conserve the funds entrusted to them and expend them wisely and well. Larder Lake cannot support the horde of promoters who now are sucking her blood.

On our way to Larder we met seven miners, employees of the Larder Lake Proprietory Gold Fields, Limited. They were walking out from Larder without enough money to pay for their meals on the way. For three months, so they informed us, they had not received a dollar of pay. Also they complained of lack of decent food. Ordinarily complaints of this sort are not to be taken seriously. In this case, however, we feel justified in making public the facts of the case.

About one mile from Fitzpatrick's Bay we came upon thirty bags of flour, stacked on the ground, with an insufficent shelter of boards. Here they had lain for weeks exposed to the weather and to the attention of the beasts of the field. Half the bags were torn open. The flour was spoiled beyond use. When one remembers that transportation alone cost between four and six cents per pound to this point, it becomes impossible to furbish up an excuse for negligence such as this.

These things must stop. The country cannot afford to have money thrown away.

NEEDED—A DIRECTOR.

Upon the recent organization of the Mines Department at Ottawa, Dr. A. P. Low was appointed Deputy Minister. Under his care were placed the two divisions —the Geological Survey and the Mines Branch. Dr. Haanel is Director of the latter. Dr. Low is still, nominally, the Director of the former.

The burden of administrative work falls heavily upon the Deputy Minister. It is understood that, to allow him to do justice to his higher duties, a Director must soon be appointed to take over the actual management of the Geological Survey.

Upon the staff of the Survey are many faithful servants who have served their time and who should be retired with honor. No one of these is capable of pulling the Survey out of the rut into which it has fallen. Reorganization must be left to a young and vigorous man. His appointment must not depend upon politics. His hands must be free to smite and to build.

A political appointee would be a misfortune.

Of all Federal appointments this is the one that most concerns mining men. The Government choice will be influenced largely (indeed it should be decided wholly) by the recommendations of such bodies as the Canadian Mining Institute. The man chosen must be not only a geologist—he must be a fearless, just and capable manager. There is restlessness and dissatisfaction among the younger members of the Survey staff. The new Director must deserve and win the respect of these men, and must also have the earnest co-operation of the older men.

Editorial Note.

New Brunswick will soon become a producer of iron ore. At Bathurst and at Lepreaux work is being done in substantial deposits of magnetite.

Urgent enquiries are being made of us as to possible sources of molybdenite. We shall be glad to hear from any of our readers who are in a position to ship this ore. A large market demand is developing.

Technical education is making headway in Nova Scotia. The system of schools is somewhat clumsy. But under its present energetic management there is no doubt that good results will follow. In no other Province of the Dominion is so much attention being paid to the education of workmen.

The *Canadian Engineer,* in a recent issue, referred to the Atikokan blast furnace as the "first blast furnace to produce pig iron from all-Canadian ore." This is quite incorrect. For years the Londonderry Iron & Mining Company's furnace at Londonderry, Nova Scotia, has been producing pig iron from domestic ores. Moreover, the Radnor charcoal furnace at Radnor, Quebec, has been doing the same. Also a considerable number of charcoal furnaces in Quebec have in the past used entirely Canadian ores. Our contemporary should avoid dangerous ground.

As we are going to press telegraphic advices have been received to the effect that the Granby smelter has been closed, throwing at least two thousand men out of employment. The low price of copper is said to be the immediate cause of this unfortunate event. A contributory cause has been the excessive wages paid to workmen. A rigid minimum scale of wages is a serious detriment to any industry. In hard times it should be possible, easily possible, to adjust wages to conditions. Unions, for their own good, should make this a recognized principle. The labor organizations very promptly demand a share of profits when trade is good. They should not expect employers to bear all the burden when depression comes.

NO "UITLANDERS" NEED APPLY.

Having ransacked the world's scientific centres and attained to that perfection where the metallurgical engineer is being requisitioned to solve close questions remaining unsolved, it is proposed by the leader of the Opposition to the Jamieson Administration at the Cape that South Africa shall proceed instanter to be self-sustaining in the matter of geologists, mining experts, miners, engineers and metallurgists.

No country has profited more fully than South Africa from the brain products of Freiburg, McGill, California and Stanford, Cornell, the Royal Schools of Mines, and technical institutes generally; nowhere has a higher premium been paid to the specialist. Becker, Molengraaff, Williams, the Jennings, Hammond, Ross Browne, Corstorphine, Hatch, Webb, Yeatman, Iaverneh, Raymond, Webber, and others of more or less note, were commandeered by Hamilton Smith and his successors in the exploitation of the low grade bankets of the Witwatersrand and diamond mines of Griqualand West, Orangia and the Transvaal. Coarse crushers and the Californian stamp reduced exceptionally hard rocks to requisite meshes. The Home Country's improvised cyanide process released precious gold contents otherwise not economically extractable. Filter presses, conceived in Germany, rock drills, diamond drills, all the appurtenances of mining at great depths, were provided by foreign instrumentalities.

A section of South Africans, born in the sub-tropics, recognizes all this, and would have been worse off had it not been so, but it is the fatuous contention of those so holding, that diamonds and gold leaving that country offer no permanent substitute, consequently mining is to be measured, industrialism divorced from the prime factor of profit in the tonnage turnover, and ultimately the foreign authority is to be given "Paddy's Rise." Mr. Merriman, once a party to the Rhodes amalgamation of Kimberley interests, and now the leader of the Bond or South African party at the Cape, outlines this programme. Upon this platform he seeks to effect the federation of South African States. A Government monopoly in wines and liquors, together with training institutions precedent to the implied exclusion of foreign talent, completes the Merriman conception of the fitness of things. When this has been accomplished, he argues, there will be no occasion for outsiders. Nothing, however, is said of the competency of those undertaking all this to find the millions of fresh capital for which there is urgent demand from the directorates of non-producing or undeveloped properties which are unlikely to place a set of timbers until the Rand's credit improves.

Because the Witwatersrand is the greatest of goldfields, its concentrated riches being so unique as to permit of large capital expenditure in the reasonable certainty of return on the same over a fixed period, anything pertaining to technical mining chiefs there employed is of international importance. The diamond mines of Kimberley have left little to be determined in the treatment of "blue ground" contained in the "pipes" or the recovery and classification of the gems. Economics in breaking rock and bringing it to mills, in expediting cyanidation, in secondary agencies, in promoting the efficiency of labor units, white and black, are still in the making. Recently stamp duties have been increased, extraction has attained to 95 per cent. and over of assay values. Stoping devices promise important curtailments in costs. Explosives are half what they were ten years ago in the item of mining. Spraying and ventilation regulations have minimized the risks of phthisis.

Such are the benefits of interchanges of knowledge. Had Bantjes and Struben been left to their own resources their discovery of the auriferious "bankets" would have been insignificant. It was the adaptation of cyanide and what has followed, the enterprise of Fraser & Chalmers, Gates, Allis-Chalmers, Ingersoll-Sargent, the General Electric Company, Westinghouse, Sandycroft, Babcock, Koppel & Company, the Jeffrey Company, and hosts of others, that induced promoters to wisely and unwisely capitalize the Witwatersrand at £300,000,000 and more. Mr. Merriman was one of the beneficiaries of this industrial progression. He now takes the insular rather than the intercontinental view revealed in Rhodes scholarships and endowments and Beit bequests. Where he errs is, in the contention that South Africa has chapter and verse, precept on precept, for what its young men should know in order to supplant Canadian, American, British and German scientists. The sooner he unlearns or sets aside these conceits, the quicker will be the recovery of a gold-getting industry upon which international exchange markets are impinged.

Under the Milner Administration, counselled by a Technical Commission and Prof. Hele-Shaw of Liverpool, the Kimberley School of Mines was absorbed by the Transvaal authorities and became the nucleus of a high class collegiate institution for the benefit of young colonials and those employed in the mines. "Nowhere," said Prof. Shaw to the writer, "is there such a perfect training ground as the Witwatersrand. Here you have the most up-to-date mechanism, the most modern methods, an infinite variety of material for experimentation." The late Mr. Beit provided in his will for this Transvaal University. Hardly had his will been probated when it was proposed to locate this technical institution at Pretoria, thus throwing into disuse the ground previously donated by the member of the firm of Wernher, Beit & Company, the ramifications of which are world-wide. The historic rivalry between the political capital, Pretoria, and the industrial capital, Johannesburg, again asserted itself. Rather than do as Beit decreed, as Sir Julius Wernher in greater degree is now striving for in London, the disposition seems to be to accept the Merriman dictum that South Africa must be up and doing for itself—a proposal that is excellent in principle, though ill-advised when premised upon proscription, however remote that policy must be in its consummation.

Scientific living to learn has universal interdependencies. The outside expert and technical adviser does not always make the most efficient inside counsellor and friend. On the other hand, "the new man in the camp" commands respect. South Africa has the raw material with which to promote great enterprises. It has produced a dozen wealthy mining speculators—Robinson, Bailey and others—and several capable engineers and mine managers, among the engineers being Greathead, who first projected the London "Tubes." In the work of pioneering the sub-continent has distinguished itself, but when it is claimed that those colonies can become self-sustaining in matters of research and capital, Mr. Merriman might as well advise that Canada should do the same, that emigration is prejudicial, that scientific associations are unnecessary evils, that free trade in ideas is not to be entertained.

Canada stands foremost with Germany in its popular and higher educational systems. The United States, with all its wealth and educational resources, has taken leaves out of the teachings of pedagogues of all nations. The Mother Country is awake to its own shortcomings. South Africa has excellent material for much of what Mr. Merriman suggests, yet when that gentleman decries prevalent pessimism and advocates the narrower view in order to gain political advantage, he becomes as pastoral as his "backveld" constituents.

Apropos to the foregoing, the London *Daily Mail* of October 2 has this on another phase of the Merriman-Bond party programme, in which Gen. Botha is co-operating:

VICTORIA FALLS AND THE RAND.

While Mr. Mershon is talking of the practicability of conveying power from the Victoria Falls to the Rand, the *Glasgow Herold* has unearthed a speech much to the point by General Botha, delivered on August 24, which, it says, has hitherto remained unreported. General Botha, according to our contemporary, "speaking at Standerton at a meeting of Boer electors, declared that the Transvaal Government would oppose the introduction of electric energy from the Victoria Falls—that is, the grant of the way-leaves necessary. The argument of the Prime Minister of the Transvaal was that this proposal would ruin the coal mining industry of the Transvaal, and incidentally reduce the colony's revenue from the mineral traffic of its railways."

How ridiculous all of this is will appear when it is recalled that the Botha-Merriman party opposed Chinese labor, demands prolongation of production irrespective of returns on capital, and now threatens a power scheme which might save the industry from the embarrassments arising from political wrangling. Many doubt the feasibility of power transmission all the way from the Zambesi to the Vaal River. Mining firms are taking the risk because their power bills are very large. For Mr. Merriman to advocate what he does, and Gen. Botha to threaten the Victoria Falls scheme, rather than recognize the advantages of domestic economics of the Government, leaves capital more than ever indoubt regarding South Africa.

ALEX. GRAY.

Liverpool, Oct. 2, '07.

THE DELORO MINING AND REDUCTION COMPANY.

I.

A smelting establishment, as interesting as it is unique, has been completed at Deloro, Ontario. The cause of its erection was the crying need of a Canadian metallurgical plant that would treat the arsenical ores of the Cobalt district. Such a plant, of course, does exist at Copper Cliff. But the increasing output of Cobalt camp, the complexity of the ores, and a growing sense of the futility of shipping ore to American smelters, pointed indisputably to the necessity of building a new plant.

Deloro is historic ground. The superintendent of the Deloro Mining & Reduction Company, Mr. P. Kirkegaard, has played an important role in the development of the famous gold-arsenic mines of the district. It may then be not irrelevant to incorporate a short sketch of Deloro's mining history in this article.

I shall not attempt to trace the mining activities of the famous Deloro mine farther back than 1898. The mists of nine or ten years are hard enough to penetrate. The rising generation thinks in years, not decades.

The year 1898 witnessed the reopening of the Deloro mine after a shut-down. The Gatling, Tuttle and Keswick shafts were deepened to 192 feet, 122 feet and 50 feet respectively. Eight hundred and seventy-eight feet in all of levels were reported in the mine. A new 10 stamp mill, a bromo-cyanide plant, a well-fitted laboratory and a new power house were added during this year.

Great progress was made in 1899. Not only were extensive underground developments carried through, but the plant was enlarged so as to include the process of arsenic recovery. The owners, the Canadian Gold Fields, Limited, were now successfully extracting gold and arsenic from the Deloro mispickel ores.

The concentrates from the stamp mill after being treated with bromo-cyanide were dried and roasted in a revolving cylindrical roaster. The volatilized arsenic trioxide was then condensed in a series of brick chambers with vertical baffle walls and collected from these chambers. The product was refined by re-roasting and re-condensing.

Important enlargements were projected and begun in 1900. The stamp mill was doubled in capacity. Wilfley tables, Bartletts and Frue Vanners were installed, and an extra vat for the cyanide plant was built; the arsenic plant, moreover, was completely reorganized; and underground development was not neglected.

In 1901 operations were continued on a full scale. Improvements and additions were constantly being made.

Calamity overtook the mine in March, 1902. A heavy flow of water was encountered in sinking a winze from the fourth level. As a consequence mining was stopped and the stamp mill ran out of ore. The arsenic plant, however, continued treating concentrates and ore from other properties.

There had been, meanwhile, much talk of consolidating the various mispickel properties of the Marmoro region and of centralizing operations at Deloro. Nothing came of this. Work was then suspended at the mine and plant of the Canadian Goldfields, and was not resumed.

The production of arsenic from 1899 to 1902 inclusive, all of which is credited to the Deloro works, is shown in the following table:—

Year.	Tons.	Value.
1899	57	$ 4,842
1900	303	22,725
1901	695	41,677
1902	800	48,000

The suspension of operations was due mostly to a heavy drop in the price of white arsenic. The intricate problems asociated with the reduction and smelting of the ore and with the recovery of arsenic and gold had been attacked and solved by Messrs. Kirkegaard and Wright. The mine and plant had been brought to a condition of great efficiency. But an absentee board of directors and a depressed market turned the tide.

It will throw light upon the present work of the Deloro Mining & Reduction Company to glance for a moment at the methods employed by their predecessors.

As to the form and origin of the Deloro deposits, Dr. W. G. Miller confirms the conclusions reached by Mr. Kirkegaard. In the Eleventh Report of the Ontario Bureau of Mines, Dr. Miller writes thus of them:—

"The ore . . . consist essentially of mispickel . . . together with gold in quartz. Associated with the quartz is considerable dolomite and calcite. This latter mineral frequently contains iron in the ferrous condition . . . Iron pyrites in much smaller quantities than mispickel is also present. Copper pyrites is found at time . . . Secondary minerals, such as hematite, arsenolite and chlorite are also present. The mispickel at times occurs well crystallized in characteristic forms.

"Gold is found in visible grains and scales in the quartz and associated with the mispickel, sometimes, but rarely, occurring in minute rounded grains attached to the faces of mispickel crystals. The greater part of the gold is, however, mixed through the mispickel in a very finely divided and invisible form . . . The diorite in which the ore bodies are found at the Deloro is finer in grain than at the Belmont mine. There appears to be two varieties of dark colored rocks in this vicinity, one of which is clearly of igneous origin, holding fragments at times of the other. The latter may be different in origin from the former and is often closely associated with crystalline limestone or calc schist . . . The ore bodies in the diorite cut across granite dikes, as is evident from the dump heap . . . Since dikes of granite are never found cutting through or disturbing the ore bodies, it is evident that the fissures or cavities now occupied by the ores were formed subsequently to the period when the granite cut through the diorite . . . Along the walls where the diorite has been decomposed the rock is a schist, talcose or chloritic in character. The edges of the ore lenses pass into this schist, which is distinctly laminated. When rock of this character is met with in the workings it is an indication that an ore body is near at hand."

A further extract from papers read by Messrs. Kirkegaard and Wright before the Canadian Mining Institute at Montreal in 1901 describes the treatment of the ore.

"A modern system for hoisting, sorting and carrying the ore a distance of 800 feet to the mill has been adopted. There are 20 stamps weighing 850 pounds each, 10 dropping 100 times to the minute with 6 to 7 inches drop. Screens are 40 mesh burr slot. Crushing capacity is 80 tons a day. The average saving is 57 per cent. of assay value by amalgamation only. The concentrating plant consists of three hydraulic classifiers, and five 6 foot smooth belt vanners for the old 10 stamps; and three Wilfley tables, one classifying cone, and one Bartlett table for the new 10 stamps. The tailings carry only 2 to 2.5 per cent. of the original gold values and 0.5 per cent. of the arsenic contents of the milling ore. The concentrates are transported in cars to the leaching plant, where they are treated by the bromo-cyanide process. This consists (1) Extraction of gold by leaching the finely ground ore with a solution of potassium cyanide to which is added a small quantity of a solution of cyanogen-bromide—a haloid salt of cyanogen; (2) precipitation of the gold from this bromo-cyanide solution by means of metallic zinc; (3) removal and smelting of the zinc-gold slimes, thus obtaining the pure gold.



NEW COBALT PLANT—LOOKING NORTH-EAST.

"The plant now in use, situated in a two storey building below the mill, consists of four leaching vats fitted with sand and pebble filter bottoms and bottom discharge gates, four solution or 'liquor' tanks on the floor above, three small Northey duplex steam pumps for circulating the liquors, three small 'sump tanks,' each of 40 gallon capacity, two 50 gallon tanks holding stock solution of cyanogen-bromide, one Salman's patent precipitating cone for zinc fume, filter press, one zinc box pipe systems, one acid treatment tank, one settling tank and one filter tub. The extraction of gold from the concentrates gives an average of 90.5 per cent. This with the values saved by amalgamation gives a total



NEW COBALT PLANT—LOOKING NORTH-WEST.

saving of 88 to 90 per cent. of the original gold contents of the ore, a result which, as an average of two years' steady work, is generally admitted to be exceptional on so refractory an ore. The concentrates, after the extraction of the gold, are sent to the arsenic works, where they are calcined for the arsenical contents. The crude arsenic resulting from the roasting is refined, and produces white arsenic of a pure white color, analyses of which show 99.6 to 100 per cent. pure arsenious oxide (As_2O_3). The production is eighty tons per month."

The reader will gain from the above a fair conception of the manner and scale of operations conducted by the Canadian Goldfields, Limited. It may be remarked that the Deloro plant stands unique in America.

II.

After a year or more of preparation the plant of the Canadian Goldfields has been remodelled, large additions have been made and the new, complete and modern metallurgical establishment operated by the Deloro Mining & Reduction Company has commenced treating ore from Cobalt.

The crushing department of the establishment is equipped with one Blake crusher, 7 inches by 10 inches; high speed rolls, 8 inches by 24 inches; and a No. 5 Krupp ball mill. The ore, after crushing, is elevated to the upper floor in cars on a 6 foot by 6 foot platform elevator. Both floors are provided with a system of rails and turntables to facilitate moving of cars from the various departments to the elevator; and again from the elevator to the bins. The ore is elevated to the top floor, emptied into large steel stock bins and thence fed automatically to sampler. One-tenth of the ore is cut out for a sample and is then taken to sampling floor.

Sampling Department.—The sampling department consists of two rooms, one having a smooth sampling floor of concrete, the other containing a complete set of sampling machinery. This machinery includes rock breaker, sample grinder, pebble mills, bucking plates, screens, scales, moisture scales, drying oven, etc.

The bulk ore, after being fine-milled and weighed, is elevated to a steel hopper from which it is fed automatically to a Snyder sampler, which is set to cut out 10 per cent. of the ore.



New Cobalt Plant and Old Arsenic Works—Looking East.



Interior of Arsenic Works—Condensing Chambers.

This 10 per cent. is again fed to a Snyder sampler, the quantity thus obtained being taken in a closed buggy or barrow to the sampling floor. Here, after thorough mixing, it is coned and quartered.

The first quarterings of this sample are divided into two distinct samples, which are again quartered down independently of each other.

The duplicate samples thus obtained are ground in pebble mills after weighing. This obviates losses by dusting. The metallics are separated on a 100 mesh screen, and weighed and assayed separately.

From each of these final pulp samples six sets of laboratory samples are drawn, the remainder of pulp being sealed up and retained until settlement is made for the shipment of ore.

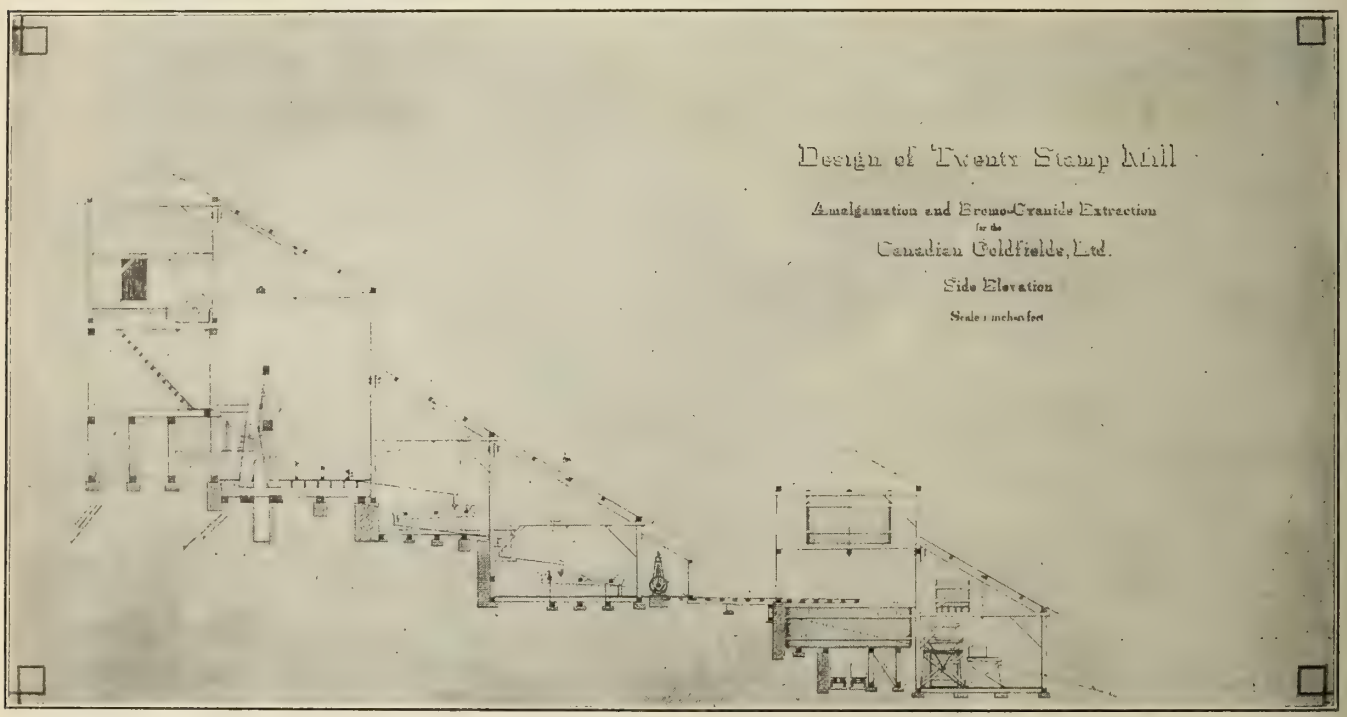
The six sets of samples above mentioned are sealed in the presence of the shipper's representative, two samples being handed to the latter, two to the Deloro Mining & Reduction Company's sampler and the remaining two retained for umpire assay in case of any disagreement in shipper's and smelter's assays.

room is composed of two glass partitions. This permits the shipper's representative to see the whole operation of weighing, quartering, etc. He also sees the taking of the bulk sample. The arrangements at this point are most ingenious. Every inch of space has been utilized to the utmost advantage.

The crushed ore after sampling is again elevated to a series of stock bins. For storage both of a large quantity of any given ore and of considerable quantities of different ores, capacious steel bins are provided. Large platform scales are placed on the first and second floors. Under the bins scales also are placed to weigh out aliquot amounts of ore for treatment. All the bins are fitted with gates. A system of tracks and turntables under the storage bins reduces traffic to a minimum.

As the ore is taken from the bins it is again weighed accurately and is transported to that section of the plant where it will meet with treatment best suited to its requirements.

A large revolving cylindrical drier, designed at Deloro, is being completed.



When practicable the metallics from the screening of these samples are similarly divided into three portions.

The metallics obtained from milling bulk ore are melted into bars which are weighed and sampled by drilling. A special mill is used in the sampling room for reducing the drillings to the necessary degree of fineness for final sampling and assaying.

All final quartering of samples is done on a table fitted with a plate glass top, which presents an ideal surface for this particular work. It is at this stage that errors are most apt to creep in. As the samples are reduced to smaller and smaller size the dangers of contamination increase. A wooden surface is retentive of the finer particles of ore and metallic silver. An iron surface wears unevenly and fragments of its surface are often included in the sample. A glass surface is smooth, hard, readily cleaned and easily renewed in case of accident.

The sampling department occupies the north end of the new building. The passage between the crushing department and the laboratory section of the sampling

In treating custom ore the Deloro Mining & Reduction Company will pay not only for cobalt (above a certain per cent.) but for arsenic also. Full value of course will be paid for the silver contents of ores received. As the capacity of the plant is enlarged the full benefits of this policy will be felt in Cobalt and newer districts. But most particularly will the reopening and enlargement be felt in the district of Deloro. The plant has an output capacity of three tons of white arsenic per diem. It will thus be able to handle a large quantity of arsenical pyrites without interfering with its functions as a reducer of Cobalt ores in the slightest. It is now prepared to treat about 20 tons of Cobalt silver ores per diem. Many of its units, however, are sufficiently large to allow for twice this tonnage. It is therefore only a matter of time and slight additions of machinery before 40 or 60 tons may be treated daily.

The old plant was a large one. The new two storey building measures 30 feet by 150 feet. An ell extends from this measuring 60 feet by 100 feet. The old plant,



GENERAL VIEW OVER DELORO MINE—LOOKING NORTH.

all of which is now in commission, measured 60 feet by 150 feet.

The stamp mill, which is in excellent condition, presents more points of interest than can well be enumerated here. Manager Kirkegaard has for years past carefully changed and improved his milling practice until now the stamp mill embodies the last word of modern methods.

The general equipment of the stamp mill has been described already. A Vezin sampler has been added. A crushing capacity of 75 tons of ore per diem is attained with the stamps dropping 100 and 110 to the minute. The height of drop is 7 inches. To secure this rapid drop Manager Kirkegaard has designed a cam with a special involute. Even at 110 steel never touches steel in the mortars. Repairs are seldom necessary. The pitch of the amalgamating tables is extraordinarily steep—2 1-4 inches to the foot. The plates themselves are broken up into short sections. These features are necessary to keep the plates clean and to secure a maximum amalgamation. Below the tables a screen is placed to catch any coarse particles.

The mill practice has been evolved, of course, with reference to the heavy, sliming arsenical ores of Deloro. Experience has proved already that it is well adapted to Cobalt ores.

Water is fed to the mortars from the bottom, in line with the dies. This prevents banking and cogging and has proved very effective with the dead, inert ores treated.

The battery frames are constructed on lines of wonderful simplicity and strength. Roughly the elevation corresponds in shape to the letter A, which makes it self-contained. Vibration is minimized.

After leaving the plates the pulp is run through a mercury trap. Thence it goes to the first set of concentrators. The tailings from these are classified hydraulically, making three products, which in turn are treated separately. The combined concentrates are then subjected to the bromo-cyanide process. The tailings are led off in a launder and automatically sampled at the point where they leave the mill by a special sampling device, designed by Mr. Kirkegaard. The basic idea of this sampler is original. The flowing pulp is the motive



Manager's Residence and Company's Office.



Deloro Village.

force. Hence the speed varies according to flow. The samples, it is claimed, are always aliquot parts of the run. The sampler cuts 1-60th of the total pulp. It takes samples across stream at intervals of about 6 minutes.

In the cyanide plant the pipe system for handling the different solutions is ingeniously painted in different colors—red, white and blue—to obviate mistakes. To



General View Over Deloro Mine—Looking South.

Mr. S. Wright, who, with Professor S. F. Kirkpatrick, is associated with Mr. Kirkegaard, belongs the credit of this effective scheme.

While a detailed description of the cyanide plant is impossible just now, a few outstanding features may be noticed. In the large settling box, for instance, sheets of glass are used as settling plates, and the circulation of liquors is effected by direct acting pumps.

A commodious laboratory, detached from the other buildings, completes a square, the other three sides of which are formed by the stamp mill, cyanide plant and power house, all of which are also detached and independent.

The power house is an airy, well-lighted brick building. The 20 drill compound steam and single stage air Rand compressor has been sold to the Cobalt Central Mining Company. Its place will be supplied by a motor driven compressor. In addition to this there also is a smaller compressor, cross-compound steam and air, which is exclusively devoted to pumping from the mine.



Deloro Church.

The system is known as the Harris air-lift. It is capable of handling 500,000 gallons in 24 hours.

The installation of one 150 h.p. Weber suction gas producer is now complete. The order was filled by the Weber Gas Engine Company of Kansas City. This drives a 100 kilowatt alternating generator of the Bullock type. Power is transmitted 1,800 feet to the new Cobalt plant, where all machinery will be motor driven. Light will also be furnished from here for the whole plant.

For the stamp mill there is independent power. A 75 horse-power Robb-Armstrong high speed engine has given extraordinarily good srevice. The engine was guaranteed by its makers not to vary more than 2 per cent. So admirably governed is it that its speed varies well within this limit when two rock breakers (requiring 20 to 30 horse-power) are thrown off or on. This engine has had four continuous years of high speed mill service and has never required repairs. It certainly seems to demonstrate the suitability of a high speed engine for stamp mill work.

The concentrators are run by a separate small engine.

Within the limits of a short article it is quite out of the question to attempt to do more than merely indicate a number of the more striking facts of such a plant as that of the Deolro Mining & Reduction Company.

One is struck, on arriving at Deloro, by the neat houses of the workmen; the substantial offices; the attractive assembly hall, which is used for and adapted to both religious and social purposes; the tennis court; the manager's residence. All have an air of permanence and comfort.



Deloro Tennis Court.

As mentioned above, three men, Messrs. Kirkegaard, Kirkpatrick and Wright, all of them in their several branches exceedingly well qualified, conceived and carried out the scheme of establishing a metallurgical plant at Deloro.

They have evolved their methods with elaborate care. Mr. Kirkegaard brings to the work a rare mechanical genius and a lifetime of experience. Mr. Wright is a metallurgist, and chemist, of solid attainment and keen executive ability. Mr. Kirkpatrick has made a reputation already in the chair of Metallurgy at the Kingston School of Mining. With three such men at the helm there should be nothing to hamper the progress and growth of this new plant.

At the annual meeting of the Providence Mining Company, held recently at Greenwood, B.C., a resolution was passed authorizing the directors to issue $500,000 6 per cent. bonds, to enable sinking to be continued to the 1,000 foot level. The following gentlemen were elected to the Board of Directors: Messrs. M. F. Madden, F. Byrnes, M. S. Madden, O. V. O'Donnel, H. J. Fitzgerald, F. Rudolph, D. B. Scully, of Chicago, and W. S. Macy, of Phoenix.

RESCUE STATIONS IN GREAT BRITAIN.

In the issue of THE CANADIAN MINING JOURNAL for 15th April, 1907, the author gave a brief description of the various types of rescue apparatus in use in the Old World, and a few notes on the progress of rescue stations and rescue work in mines in Great Britain may not come amiss to the readers of this JOURNAL.

A large amount of interesting information was recently given to a Royal Commission by Mr. M. H. Habershon from experience obtained in the working of a joint rescue station at Tankersley, near Barnsley in the South Yorkshire coal field in England.

This station was erected in 1901 by three colliery companies, who between them worked in the neighborhood of twelve mines. The building of this station was largely in the nature of an experiment and was looked upon as of somewhat doubtful value by many mining men. The funds available were very limited, too limited in fact for any really effective work to be done, more especially in view of the fact that six years ago breathing apparatus were not the finished and effective devices they are today. The first apparatus obtained were the Giersberg helmets. These are now completely obsolete and never were of any real utility. Then several apparatus of the Shamrock type were obtained, and a Pneumatogen also. The latest addition to the station, and one that has given considerable satisfaction is the Draeger helmet apparatus.

Mr. Habershon gives some figures of tests made with the Draeger apparatus, which show that it is a really practical machine. One man wore the helmet for four hours and three minutes, doing no work during this time. Another man wore it for five hours and walked 7,400 yards during that period. At the conclusion of the test has was very hungry, which it is said is the most noticeable effect of wearing the apparatus for any long period of time. This same man raised a 56 pound weight to a height of seven feet 610 times in one hour and forty minutes, which is equal to 239,120 foot pounds of work.

The more important points brought out by Mr. Habershon in his evidence as the result of his six years' experience are summed up in the following:—

All men are not constitutionally suitable to be trained to wear breathing apparatus, and it is not a matter that can be mixed with ordinary ambulance training.

Apparatus of this kind is worse than useless, and is in fact a veritable death trap unless it is under the charge of a trained man and kept in constant and perfect readiness for instant use.

Mr. Habershon is opposed to apparatus being kept at separate collieries where it might not be properly overhauled periodically, but thinks it is essential where a group of collieries is to be served to have a central rescue station in charge of a thoroughly competent man. He states that the number of really competent men of this kind could be counted on the fingers of one hand in England to-day.

From the remarks made by Mr. Habershon he appears to have no doubt that the best and most practical apparatus is the Draeger, and he prefers the helmet to the mouthpiece.

A complete justification of the expenditure involved and of Mr. Habershon's remarks as to the value of a central rescue station has just been given by an underground fire that occurred on the 15th of October this year at the Wharncliffe Silkstone Collieries. It was to the initiative of the managing director of these collieries, Mr. Geo. Blake Walker, that this station really owed its origin, and it is singular that the first really effective use of breathing apparatus in dangerous underground conditions in England should have occured at this colliery. The fire in question originated in an electrical engine house about one mile and a half from the pit bottom. It was impossible to approach the seat of the fire in consequence of the pungent fumes, and word was sent to the rescue station, where in a very short time three of the officials were fitted with the Draeger helmet and proceeded to the engine house. They had a hard and a hot time, but succeeded in extinguishing the fire after an hour and a half's works. The Wharncliffe Silkstone Colliery Company work six seams, which are all connected by means of stone drifts and shafts, so that a fire in one seam would in time have involved the whole mine, and it would have been a very difficult matter to seal such a mine. The confidence of the men who put out this fire in the efficacy of their apparatus is shown by the fact that after all the men had been withdrawn from the two seams immediately involved the three of them proceeded a mile and a half from the pit bottom clad in these helmets as their sole protection from suffocation. Such confidence can only be obtained by constant practice, and the knowledge that the man who was responsible for the condition of the apparatus knew his business and was to be trusted in a time of emergency.

Another proof of the efficacy of these apparatus in saving human life was recently given at the Saar and Mosel Colliery at Merlbach in the Saar district of Germany. An explosion occurred and immediately afterwards a party of twelve men descended. After an hour's work they brought the survivors safely to bank, eight in number, and also salved the bodies of four men whom the explosion had killed. This makes a total of about 50 lives which have now been saved by the use of the Draeger apparatus.

Although primarily these breathing apparatus were designed with a view to saving life after explosions, yet it is possible that their greatest practical utility is in fighting underground fires. Like all fires, those that start in a mine are small affairs at first, but although they do not really increase so rapidly as fires on the surface, they are much more difficult to approach, because of the confined area and the restricted ventilation. The breathing apparatus enables men to approach and extinguish an underground fire in its incipient stage. One fire thus averted will repay many times the initial outlay for material and training and as remarked once before in the columns of the JOURNAL, no colliery company that values the lives of its men and the property of its shareholders can afford to ignore the provision of apparatus of this kind.

F. W. GRAY.

The Le Roi Company is to be very heartily congratulated on securing the services of so able a metallurgist as Mr. Thomas Kiddie to take charge of operations at its Northport smelter. Mr. Kiddie has made a notable success of smelting on the coast, especially in connection with the operation of the Tyee Copper Company's works at Ladysmith, which were designed and erected under his direction. He has lately acted as manager of the Hadley smelter, Prince of Wales Island. Mr. Kiddie, it is understood, will enter upon his new duties on December 1st.

MONAZITE AND ZIRCON.

(Advance chapter from "Mineral Resources of the United States," 1906.)

By Douglas B. Sterrett.

Introduction.

The demand for thorium for the manufacture of Welsbach and other forms of incandescent gas mantles has increased yearly, and until some other invention takes place of these mantles this demand will continue. Improvements are made from time to time in the manufacture of gas mantles, and two new inventions with this object in view have been reported—one in use in Germany, the other in England. The German mantle uses a form of copper cellulose impregnated with the proper salts; the English mantle is made more durable by adding an ingredient called "laddite" to the thorium and cerium solution in which the mantle is dipped. It is said that the latter mantle has not been injured after burning 2,500 hours.[1]

The minerals from which thorium and the other rare metals used in the manufacture of gas mantles are obtained are monazite, thorianite, and thorite. The bulk of the supply of thorium is obtained from monazite, which is essentially an anhydrous phosphate of cerium, lanthanum, and idymium, containing a small and variable percentage of thorium. Though occasionally found in crystals and masses of many pounds weight, the source of the commercial material is in the form of sand. The grains are opaque to translucent and sometimes transparent, and they vary from light yellow to reddish yellow to brownish in color. They also sometimes slightly greenish. The freshly broken or unaltered mineral has a resinous luster. This luster is brilliant, especially on the cleavage faces. The mineral is brittle and has a hardness of 5 to 5.5. It can readily be crushed between the teeth and yields a soft grit, quite distinct from the harder minerals sometimes mistaken for it. The specific gravity varies from 4.9 to 5.3, and is mostly over 5.

Thorite is a silicate of thorium, theoretically containing 81.5 per cent. of thoria, though practically it generally carries less than 70 per cent. Thorianite is an oxide of tohrium containing uranium and the metals of the cerium group, and carries from 70 to 80 per cent. of thoria. These two minerals have been obtained in commercial quantity only in Ceylon.

Monazite.

North Carolina, South Carolina, and Georgia.

Location and Occurrence.

The area in which workable deposits of monazite have been found in the Carolinas is growing yearly, especially to the southwest in South Carolina, where parts of Laurens, Pickens, Anderson, and Oconee countries are now included. This extends the belt in which deposits of comemrcial value are known to exist nearly to the Georgia line. To the northeast the belt has been extended beyond the limit set for it in southern Caldwell and northern Catawba countries into northern Iredell County, and will doubtless be traced farther. This area contains upwards of 3,000 square miles, and includes part of all of Iredell, Caldwell, Catawba, Burke, and Polk countries in North Carolina, and Cherokee, Laurens, Spartanburg, Greenville, Pickens, Anderson, and Oconee countries in South Carolina.

Monazite has been found at other places outside of this area, but as yet no workable deposits have been developed. Thus Nitze[2] mentions the finding of monazite in Hall County, Ga., near The Glades, on the north side of Chattahoochee River, about 10 miles northeast of Gainesville, where it occurs in the gold placers of Flat Creek and its tributaries, the Glade, Stockeneter, Hamilton, and Huram branches.

A prospect in the extreme northeast corner of Georgia, in Rabun County, is being investigated at the present time for its values in monazite and gold. Through the courtesy of the party interested in the property the writer has learned that the concentrates assay over 5½ ounces of gold per ton, with 30 per cent. of cerium oxide and 4 per cent. of thorium oxide. Since such a high content of cerium would correspond to nearly pure monazite, carrying no other minerals such as are generally found in concentrates, the oxide of lanthanum and didymium were probably included in that report for cerium. In that case the concentrates would run a little over 40 per cent. monazite if the rare earth oxides found by assay all came from monazite. If the percentage of concentrates that can be washed from the gravel is large, such a deposit is very promising.

Among other places, monazite is reported to occur in some quantity at a few localities in Clay County, N. C. At Wilkesboro, N. C., a small quantity of monazite was found in a trial panning in Cub Creek. The area of known commercial deposits of monazite will doubtless be extended both to the northeast and to the southwest as the demands for monazite increase and the old deposits become exhausted.

The greater part of the monazite belt lies in the Piedmont Plateau. The belt crosses the South Mountain, however, in Burke, McDowell, and Rutherford counties, and borders on the foothills of the Blue Ridge. In the monazite region the elevations of the Piedmont Plateau vary from 700 to 800 feet to 1,500 feet above sea level. Much of this area is dissected by river and creek valleys from 50 to 300 or 400 feet deep.

Workable deposits of monazite do not occur everywhere in the monazite belt as described, but are confined to certain smaller belts whose direction and extent are controlled by the trend and continuity of certain rock formations from which are derived the deposits found chiefly in the gravels and sands of creek and stream beds and adjoining bottom lands. Gravel deposits may be too low grade to work on the upper part of a stream, while lower down, where the area drained contains favorable rock formations, the gravels may be rich. Hence for successful prospecting a general knowledge of the geological formations and ability to recognize those from which the monazite of the placers is derived is desirable.

Geology.

Classes of rocks.—Practically all of the rocks of the monazite region are either gneisses or schists.[3] The most important formation includes both of these types and is called Carolina gneiss. Other rock formations are gneissoid and porphyritic granite, hornblende gneiss

and diorite, pegmatite, peridotite and allied rocks, and diabase.

The Carolina gneiss is by far the most extensive formation in the monazite region and appears in nearly every section. The granite-gneiss rocks are next in importance and occur in belts and irregular shaped masses throughout the area of the Carolina gneiss. These granite masses vary from small dikes measured in feet or inches in thickness to large bodies 3 or 4 miles across. After the granites comes the hornblende gneisses, which are most prominent along the northwest side of the region, where they are generally associated with large granite masses. Hornblende gneisses occur in other portions of the monazite belt, but are not of so much importance. The Carolina gneiss presents considerable variations in composition and structure. The most common types are mica, garnet, cyanite, and graphite gneisses and schists, or combinations of two or more of these types. These rocks vary from light gray to dark gray in color and often have a light bluish-gray to bluish-black cast when graphite is abundant in them. Some of the schists are fine grained and are often composed of several distinguishing minerals, as muscovite, biotite, cyanite in fine needles, and graphite, besides fine grains of quartz and other minerals; others are composed of the same minerals in coarser grains or flakes. Garnets appear in each rock type and may be faily large even in the finer grained schist. The presence of much pegmatitic material is a characteristic feature of the Carolina gneiss.

The granite gneisses are either biotitic, muscovitic, or hornblendic in composition, and in places have a typically porphyritic texture. In the latter case the feldspar phenocrysts generally assume an augen form, caused by crushing and elongation in the direction of shearing. There is an abundant development of small red garnets throughout many large areas of these granites. A microscopic section cut from a porphyritic granite forming the bed rock at the Moon mine, 9 miles east of south of Greenville, S. C., contained the following minerals: Microcline, orthoclase, albite, quartz, biotite, muscovite, garnet, and a little zircon. The rock showed the effects of shearing, with the development of introduction of secondary minerals. The feldspar phenocrysts had been fractured and elongated, and secondary quartz had been deposited between the fragments. As a result of these metamorphic processes the feldspar crystals form augen-shaped bodies which lie parallel to the schistosity of the rock mass. The garnet is plainly secondary, and contains considerable quartz intergrown and included with in it. In other parts of the region, as in the Carpenters Knob section and much of Cleveland County, N. C., there are large areas of granite gneiss which have an even granular texture and are composed chiefly of white feldspar, gray quartz, biotite, muscovite, and garnet.

The hornblende gneisses and diorites are the only other types of rock of much importance in the monazite region. The hornblende gneisses are nearly black to dark green in color, and are composed chiefly of small interwoven and matted hornblende crystals. They grade into diorite, which is also dark colored but contains a noticeable amount of feldspar and has a granitoid texture. These hornblendic rocks are more prominent throughout the northwestern side of the monazite belt, where, along with large areas of granite, they assume considerable importance.

Pegmatite is of common occurrence throughout the region, especially in those areas where commercial deposits of monazite are found. There is a wide variation in the nature of this pegmatite. In some places it occurs as distinct masses or bodies with the typical composition and texture—that is, composed of quartz and feldspar, with or without mica and other accessory minerals, crystallized out on a large scale. In other places the pegmatite represents a re-crystallization of portions of rock formations with the formation or introduction of the component minerals of pegmatite. Sometimes the secondary minerals consist chiefly of quartz with smaller quantities of the others. Often it is difficult to determine whether certain smaller rock masses are granite or pegmatite, when the texture is not very coarse and the relations to the inclosing rocks can be clearly seen in the small portions exposed.

The peridotites are not of very common occurrence in this region. They are dark green to greenish-black basic rocks, containing the ferromagnesian minerals olivine, pyroxene, and sometimes hornblende as their chief constituents. The peridotites often outcrop prominently and generally leave rounded, "nigger-head" bowlders on the surface near their outcrop. In the majority of cases, however, the peridotites will be found to have partly altered to soapstone or serpentine at the surface. In some cases the whole mass has been thus metamorphosed.

Diabase is not uncommon in certain parts of the monazite region, and is readily recognized by its dark color, weight, and the characteristic spheroidal of "nigger-head" bowlders it leaves scattered over the surface.

Age.—Most of the gneisses and schists of the monazite region are of great age and represent highly metamorphosed sedimentary and igneous rocks. The metamorphism, folding, and faulting of these rocks have been extreme, and in most cases it is difficult to determine the original nature of the formations, since much of the sedimentary bedding and igneous texture has been destroyed by mashing and re-crystallization. This is especially true of the Carolina gneiss, which is the oldest formation represented and has been cut by instrusions of later age. The hornblende gneiss and diorite, the peridotite, and part, at least, of the granite-gneiss are also very old rocks and are intermingled and folded with the parts of the Carolina gneiss in a very complex way. Other gneisses and granites are of later age and have not been subjected to the same degree of shearing as the older ones, so that the development of schistosity in them has not been so extensive as in the older types. The gneisses and schists, particularly of the Carolina gneiss, having been interbanded with an cut at all angles by numerous streaks of pegmatitic or granite material. These streaks range from a fraction of an inch upward in thickness. In some places pegmatization is so thorough that mica has become strikingly like granite gneiss.

Associations of monazite.—The best deposits of monazite have been found in or near areas where large granite masses outcrop or where pegmatization of the country rock has been extreme. On the other hand, where the gneisses and schists are nearly free from pegmatitic material and there are no granite masses in the neighborhood the stream gravels are found to be very poor in monazite. When monazite has been found in place to any extent in the country rock it has not been in the ordinary pegmatite streaks and masses, but in portions of the rock formations where there has been extensive re-crystallization, with the development or introduction of pegmatitic material. Such pegmatization is locally a common feature of the Carolina gneiss, which is accordingly a favorable kind of rock for the occurrence of monazite.

Monazite deposits in regions where hornblende rocks are abundant generally contain a large percentage of black sand. In such cases it is often difficult to concentrate the monazite to a marketable grade. As an offset to this, however, especially in regions where granite is associated with the hornblende rocks, gold is often found in the concentrates in more than sufficient quantity to pay the cost of separation, and in some localities the concentrates generally carry also a quantity of zircon sufficient in some cases to pay for separation. This zircon is in the form of small clear crystals with a brilliant luster, which range in size up to 1 millimeter square and about 2 millimeters long. A fairly clean separation can be made by cleaning with an electromagnetic machine and careful washing. The quantity and the size of the zircon crystals found in the monazite concentrates are in general smaller in the deposits located in areas of Carolina gneiss than in the granitic and hornblende rock; likewise the quantity of gold found in the deposits in areas of Carolina gneiss is smaller and rarely pays the cost of separation.

Weathering and soils.—The rocks of this region have undergone such extensive weathering that good outcrops are the exception, and a thick mantle of residual soil covers much of the country. The kind of rock underlying certain soils can be determined, unless decomposition has been too thorough, by studying the outcrops and the gradations from such exposures into the residual soil. Thus the nature of the soils furnishes a clew as to the probability of monazite being present in quantity in the gravel of the streams; and, conversely, the nature of the country rock that a stream drains can often be told and the probable occurrence of monazite be conjectured by examining the debris in the gravels of the bottom lands and of the stream bed.

The Carolina gneiss, on partial disintegration and decomposition, often forms a gravelly soil with red clayey matrix. This is especially characteristic of the graphite-cyanite type, which is abundant in parts of the region. The pebbles are composed of small fragments of the original rock, often tufts of cyanite, impregnated with hematite or limonite, or small pieces of pure iron ore.

Garnets may or may not be present. On more complete decomposition a reddish clayey soil results, with no decided characteristics. Other types of the Carolina gneiss, in which mica is an important constituent, leaves a micaceous soil which often assumes a purplish color. Granites, on partial disintegration and decomposition, yield light sandy soils. Often blocks of undisintegrated granite occur scattered through the soils, giving additional evidence of the nature of the underlying rocks. On more complete decomposition granite yields soils of a light to dark reddish color, depending on the quantity of ferromagnesian minerals in the original rock, as biotite or hornblende. The quartz grains of the granite remain as sand mixed through a clayey matrix. Where the Carolina gneiss and granite are intimately associated, or where pegmatization has been extensive in a body of Carolina gneiss, there results a sandy soil, characteristic of granite, containing scattered through it pebbles of iron ore, characteristic of the Carolina gneiss. The relative importance of the iron-ore pebbles decreases in the soils as the quantity of pegmatite or of granite in the rock formations increases. These features of the soils are especially marked on the broad flat ridges characterizing much of the Piedmont Plateau. The hornblende rocks yield a dark reddish-brown to chocolate-colored clayey soil which is very characteristic.

Mining and Cleaning.

Wet concentration.—Nearly all of the monazite shipped from the Carolinas has been obtained from gravel deposits. These deposits lie in and along the stream and creek beds, where the monazite has collected after liberation from the decomposing gneisses and schists of the region. A part of the production for 1906, however, was obtained from a monazite-bearing gneisses rock by crushing and then separating on concentrating tables. The percentage of monazite contained in the ore treated in either type of deposit is small and probably does not often run over 1 per cent.

The usual method of working the gravel deposits has been washing in sluice boxes, though in 1906 concentrating tables were employed at several places. The form of table most used in the Wilfley or one of similar type. It is set up at the mine as convenient as possible to the gravel deposit to be treated, and is operated by a gasoline or kerosene motor. The gravel is dumped into a shaking hopper through which water is continually passing. The sand is washed through the hopper and passes over the table, while the oversize is shoveled out. At one mine the gravels are raised by a mechanical elevator and the oversize is removed in a revolving screen, from which the sand is passed over a table. In the better class of machines a number-one product can be taken off in the first washing, and the middlings be passed over a second time along with new sands. In some cases, however, where only two grades are separated, concentrates and tailings, a considerable quantity of rough concentrates is first washed out and then carefully sent over the machine a second time. In this way the grade of the sand is raised, and a very clean product is obtained.

The degree of concentration it is possible to attain by wet methods depends largely upon the composition of the gravels to be treated and the care used in treating them. Where black sands, such as magnetite, ilmenite, etc., and other minerals with a high specific gravity are abundant it is difficult to bring the concentrates up to 50 per cent. monazite, even with good concentrating tables, and the product from sluice boxes may run as low as 15 per cent. and under. In more favorable deposits, where the percentage of black sand is not large, a concentrate running 80 or even 90 per cent. can be obtained with concentrating tables, while in sluice-box washing the grade can be brought up to 70 or even 80 per cent. Where the monazite is separated from the hard rock formations the grade has been brought up to 95 per cent. and over by the use of concentrating tables. Taking the monazite region as a whole, there are not many large gravel deposits which will yield concentrates of over 40 per cent. monazite in sluice-box concentration, and the average yield of crude monazite would probably not be far from 30 per cent. Should the use of concentrating tables increase the grade of the crude monazite produced will be raised correspondingly.

Formerly the deposits of monazite-bearing gravels in the bottom lands along the creeks and streams were worked without any thought of the land being left in such a condition that farming could be resumed after mining had ceased. So the soils were washed away, and the gravels were piled up in irregular heaps and ridges . In this way the best farming lands were being ruined, and those farmers who had leased their monazite deposits found themselves possessors of nearly worthless land, with only money received on the leases. This has been remedied in many cases by more systematic working of the gravel beds. The top soil is thrown on the side of the working pit opposite to that on which the deposit

lies, and the underlying gravel is washed. When the next block of gravel is opened the soil is thrown off upon the gravel already washed in the adjoining pit. By spreading the gravel out somewhat evenly and placing the soils smoothly over it nearly the whole land is kept in condition for farming after the monazite has been removed.

It has been found that, when the stream gravels are washed for monazite and then left for a few months, especially in rainy weather, another crop, so to speak, of monazite can be obtained. This results from the washing in of monazite from the surface of the surrounding fields and hills, where it has been left by the decomposition of the original rock matrix. With this end in view, the lands draining into the streams should be plowed now and then, to give the surface waters a chance to wash the monazite into the stream beds. In many cases the farmers have preferred to wash the stream gravels themselves once or twice, or more times, a year. The usual cultivation of their farm land keeps a fresh supply of monazite stirred up in the fields, from which much of it is washed into the creeks.

Electrical cleaning.—A portion of the crude monazite is shipped to the manufacturers as it comes from the mines. The greater part, however, is cleaned by electrical machinery at local cleaning mills in the monazite region. In this way the percentage of monazite in the sand is greatly increased and the freight charges on waste products are minimized. The different types of machinery in use are (1) the Wetherill electro-magnetic machine and its modifications, (2) a machine in which the minerals are deflected by electro-magnets while falling, and (3) a static machine.

Of the Wetherill machines there are two specially designed, improved types operated in different parts of the region—one in North Carolina, the other in South Carolina. In these machines there are four magnetic fields, which lift the different varieties of sand from a main conveying belt passing through them. Smaller belts, between the main belt and the magnetic pole lifting the minerals, carry the sand attracted by the different magnets out of the magnetic field and drop it into proper receptacles. In this way magnetic iron is removed by the first field; titanic iron, garnet, and other minerals of similar magnetic intensity by the second; and coarse and fine monazite by the third and fourth fields, respectively. Quartz, rutile, zircon, gold, and other highly nonmagnetic minerals pass off as tailings. This type of machine readily cleans the sand to 90 per cent., and is able to raise it to 95 per cent. monazite by careful handling. In another type of the Wetherill machine, of which several have been used in the monazite region, there is but one magnetic field, which generally removes magnetic and titanic iron and garnet, while the monazite is left with the quartz, zircon, and other highly non-magnetic minerals. The cleaned product from this machine probably averages about 80 per cent. and does not often run over 85 per cent. monazite. When the field magnets are properly constructed it is possible to pass the sand through the machine a second time under a much higher magnetic intensity and to free the monazite of many of the other minerals left with it in the first cleaning.

In the second type of the electro-magnetic machine the sand is passed over a series of belts, and the separation is affected by the deflection in a magnetic field of the grains of mineral as they fall over the ends of the belts. The different minerals are drawn out of their ordinary course of fall by powerful magnetic fields and are carried off in different chutes. In this way a very clean separation of monazite is said to be effected.

In the electro-static machine all the minerals but monazite and garnet are lifted from the sands. This is accomplished by a cylinder about 2 feet in diameter and 3 feet long, covered with sheets of vulcanite, slightly separated from one another, 8 by 12 inches square and three-eighths of an inch thick. The vulcanite is excited by rubbing with felt-covered cylinders revolving at a high rate of speed. The speed is regulated by cone pulleys, and is made greater when the atmosphere contains considerable moisture. The sand is heated by two gasoline lamps before exposure to the electrified cylinder. The latter is revolved slowly, and all the sand attracted to it is removed by brushes.

Monazite in Original Matrix.

(New Company and Plant.)

A new company entered the Carolina monazite field during 1906. This was the British Monazite Company, representing the South Metropolitan Gas Light Company of London, which undertook to mine monazite to secure a source of supply that could be depended on at times when the selling price of thorium products becomes excessive, or the supply in the market is limited by monopolies. The new company located about 3 miles northeast of Shelby, N.C., where it has opened the old Campbell mine with improved machinery and methods. The proposition at this mine is different from that of any other mine being operated in the region, and consists in crushing a monazite-bearing rock and separating out the monazite with concentrating tables. For this purpose a frame-work mill, well designed for the placing of the machinery used in treating the ore, was built adjacent to the outcrop of the ore body. Through the courtsey of Mr. Hugh Stewart, manager for the company, the following outline of the operation is given:

From the quarry the ore rock is trammed to the mill and dumped on the feed floor whence it receives the following treatment:

1. Crushed in Gates gyratory crushers to 1 inch.
2. Elevated to bin, whence it is discharged to rolls crushing to one-sixth inch diameter.
3. Product from the latter is discharged into sizing apparatus (sieves). Material of one-fourth inch diameter or under goes through sieve and is discharged into second elevator. Material over one-fourth inch, goes over sieve and is discharged into second crushing rolls, where it is reduced to one-eighth inch and is also discharged to second elevator.
4. Second elevator sends ore into Huntingdon mills, fitted with 16-mesh screens, through which the ore is discharged.
5. Ore from the Huntington mills is collected in hoppers and fed to 1 Wilfley and 3 Overstrom tables. The seconds and thirds from the first Wilfley and middlings from the Overstrom are passed over second Wilfley table for final concentration.

References.

[1]Consul F. W. Mahin, Nottingham; Daily Cons. Rept., January 10, 1907.

[2]Monazite and monazite deposits in North Carolina: North Carolina Geol. Survey, Bull. No. 9, 1895, p. 28.

[3]Complete descriptions fitting many of these types of rocks may be found in the geologic folios published by this Survey: see Geologic Atlas U.S., folio 116 (Asheville), folio 124 (Mount Mitchell), by Arthur Keith.

(To be continued.)

HARVEY GRAHAM.

There died on Thanksgiving Day a man whose strong purpose and manful accomplishment meant very much to Nova Scotia.

Harvey Graham breathed his last at his home in New Glasgow, on October 31st, 1907.

Mr. Graham was born fifty-nine years ago in Little Harbor, County of Pictou, Nova Scotia. In New Glasgow he was educated and there he spent the early years of manhood. His first wife, Miss Hannah Fraser, was a New Glasgow lady. His second wife, a daughter of the late Alexander McKay, of North Sydney, died last August, while her husband was on his way home from Brazil.

Mr. Graham was successively manager of the Nova Scotia Glass Company, manager of the Black Diamond



Coal Company, and manager of the New Glasgow Iron, Coal & Railway Company. The last position he filled until the New Glasgow Company was absorbed by the Nova Scotia Steel & Coal Company. For several years before his death he filled the offices of director and assistant general manager of the Nova Scotia Steel & Coal Company. In these joint capacities Mr. Graham gave evidence of the stability and calm, deep strength of his character.

As a Nova Scotian and as a Canadian Mr. Graham always identified himself with progress and reform. He was an ardent, though not a bitter, advocate of temperance. He, himself, was an exemplar of true temperance—the temperance of a sound mind in a sound body.

The death of such a man is an event of sad moment to any community.

TANTALUM.

The fruitful activity in experimental metallurgic work during recent years for both scientific and commercial purposes, especially in electro-metallurgy, has made possible the reduction of metals that were before unutilized and almost unknown. The determination of the properties of these metals has suggested uses for them, with the result that there is a growing demand for ores that but a few years ago were sought only as mineral curiosities.

One of the most remarkable of these metals is tantalum. It is not attacked by hydrochloric, nitric, or alkaline solutions. It can be drawn into fine wire having a tensile strength greater than soft steel. A red-hot lump of tantalum may be at once hammered into a plate which, on repeated rehammering, becomes as hard as diamond. A diamond drill running continuously for three days at 5,000 revolutions a minute failed to penetrate such a plate, although it was but 1 millimeter thick, while the drill was much worn.

A British patent has been obtained for making writing pens from tantalum, whose hardness, elasticity, and resistance to corrosion would seem to fit it well for such use.

Tantalum is now employed principally as a filament in an electric incandescent lamp which was put on the American market in 1906. This lamp consumes but two watts per candle power, as against more than three watts per candle power for the ordinary carbon filament lamp.

The principal ores of tantalum are tantalite and columbite (a combination of iron, tantalum, and columbium), which occur in pegmatites, or coarse granites. In the United States tantalum ore may be found probably in the greatest quantity in the Black Hills of South Dakota. In 1906 one mass weighing 600 pounds was discovered. A small lot was shipped to Germany from Canyon, Colo., during the year, and small shipments have also been made from Mitchell County, N. C.

MOLYBDENUM IN 1906.

The only production of molybdenum reported to the United States Geological Survey for 1906 was from Homestake, Mont., but deposits at Dillon, Sheridan, Ophir, and other places in the same State are being prospected. Ores of this metal are found also in Maine, Washington, Oregon, California, Nevada, Utah, Arizona, New Mexico, and Colorado.

The ores are molybdenite (molybdenum sulphide) and wulfenite (lead molybdate). Molybdenite is much the more common, but most deposits are too small to justify expensive machinery and the demand is at present comparatively small. Wulfenite is more easily saved, but often carries so many impurities that it is almost impossible to use it.

The metal is employed as an alloy of steel, and, in the form of ammonium molybdate, to determine the presence of phosphorus in iron. In Europe ammonium molybdate is utilized as a fireproofing material and as a disinfectant for cloth used in railway passenger coaches and for other similar purposes. It is said to be a powerful germicide. Molybdenum salts give a fine blue color to pottery glaze. The uncertainty of the supply of this metal has probably prevented its more extensive use in steel, in which it has nearly the same effects as tungsten, even when added in a much smaller quantity. Efforts to use metallic molybdenum as a filament for incandescent electric lights have been unsuccessful, owing to its comparatively low melting point.

ENGLAND'S PREMIER COBALT MINING COMPANY.

With the permission and approval of the persons concerned we reproduce herewith a letter, written by a prominent mining engineer, in answer to enquiries about England's Premier Cobalt Mining Company.

We understand that action is being brought against this mining company by purchasers of its stock in England. Its claims are dealt with briefly and pointedly by the following letter. There is little need for us to enlarge upon it.

My Dear Sir,—

I have your letter of the 5th inst. enclosing prospectus of England's Premier Cobalt Mining Company, Limited, in which you state that the company which you represent have subscribed for shares in the said mining company, and ask me to examine and criticize some of the statements contained therein, which I take pleasure in doing so far as statement does not apply to the merits of the mine itself, of which I have no knowledge.

In the prospectus you have numbered the various paragraphs, and I will discuss them by the numbers as designated by you.

Paragraph No. 2 states that the property is in the heart of the Cobalt silver mining camp, and adjoins the Steindler, Edison, Evans and other mines, and is in close proximity to the Buffalo, Silver Queen and Hudsoy Bay properties. This property does not adjoint either the Edison or Evans mines, and is not in the heart of the Cobalt district, and with the exception of the Evans property, is more than three (3) miles from any shipping mine.

Paragraph No. 3.—The Evans mine is principally valuable for its cobalt, and their ore does not run high in silver.

Paragraph No. 4.—The Portage Bay district is at present an entirely unknown quantity, and with the exception of possibly the Evans mine, does not at present contain any paying mines.

Paragraph No. 5.—The Edison property is being mined solely for the cobalt values in the interest of Mr. Thomas A. Edison, who needs cobalt for electrical purposes. The Portage Bay district is not experiencing a boom, nor is there any reason for thinking at present that much of the best shipping ore will come therefrom.

Paragraph No. 7.—As to the formation. The report of Mr. Foster, contained in prospectus, shows that the formation is diabase and gabbro. The ore-bearing formation on the "Nipissing" is neither of these.

Paragraph No. 8.—Although rich values have been found at depth in some instances, it does not necessarily follow that rich ore will be found by sinking if it is not found at the surface. The entire surface of the Cobalt district has been planed down by glacial erosion, and surface prospecting, for that reason, is much cheaper than prospecting by sinking. Therefore, unless surface showings of value can be obtained, there is no especial reason for prospecting to depth.

Paragraph No. 10.—The Trethewey mine is not down over 300 feet, but the extreme depth is 120 feet. Values have not increased either in the Trethewey or La Rose mines (nor Drummond mine) with depth. All of these mines had exceedingly rich ore on the surface, and the owners will be perfectly satisfied if values remain the same at depth.

Paragraph No. 11.—Many of the mines in the district are shipping ore containing less than 100 ounces of silver per ton.

Paragraph No. 12.—Although it is necessary that a claim be passed by a mining inspector before lease is issued, it does not prove that this inspection is evidence of value sufficient to yield profit. They simply require that a well-defined vein giving possibility of profit be exposed. This is one of the commonest arguments used to prove that a claim is of value, but it signifies nothing from the commercial standpoint. Inspectors have been especially lenient in the Portage Bay district, because it is a new district and they desire to encourage prospecting as much as possible.

Paragraph No. 13.—Prospectus mentions that two (2) shafts have been sunk, but does not give their depth. This is exceedingly indefinite. Nor does the prospectus state the width of ore streaks which are claimed to have shown values from 321 to 900 ounces silver per ton. If these assays were made of small specimens, they are of no special use.

Paragraph No. 14.—There is no reason given in the prospectus for assuming that dividends may be confidently expected during the present summer.

Paragraph No. 16.—Prospectus states that on adjoining property (presumably the "Evans") average assays show over 3,000 ounces of silver per ton. This is not true.

The Cobalt district is a great mining district, and will be an important element in the production of silver. The district is now producing at the rate of about 1,000,000 ounces of silver per month, which is an excellent showing considering the short time the district has been in operation. During the past few months considerable deep exploration has been made, which in many cases tends to prove the strength of the veins, and the fact that in some instances rich ore is found at considerable depth.

The great success of some of the mines has stimulated the flotation of mining companies on ground of little value. In this, as in all other mining districts, there are rich and poor mines. All ground is not necessarily valuable, and unless there is evidence in the form of rich ore there is no reason why high prices should be asked for unexplored territory.

LONDON LETTER.

A Diamond Trust.

ALEX. GRAY.

A "corner" in diamonds is projected by the dominant factors in the DeBeers Consolidated and Premier Mines of South Africa. Conferences are taking place and the result is of greatest moment to the mining and monied worlds—to say nothing of the cutting trades of Amsterdam and Antwerp, and all who trim themselves with precious gems. Those who want diamonds will doubtless have to stretch their purse strings.

Details of the working agreement between these diamond producers are impossible of ascertainment; and they will so continue to the uninitiated laity. Primarily the object is to regulate the supply, but in reality the arrangement is an expansion of the Cecil Rhodes plan whereby diamonds could be won and distributed through

a central organization whose dictum is final—at least until rival mines are discovered. The Rhodes idea has proved its efficacy in practice. Its evolution has been one of the most thrilling chapters in the story of latter-day mining. If Canadians are to follow their fancy for "blue whites," "Cape whites," "Canaries" or better class "stuff," as it is characterized by the trade, they either will have to pay tribute to the contemplated clearing house or find a few mines of their own. That there are diamond mines on your side of the water is an undisputed fact. Whether those mines are payable is another matter, yet the doubt will never be removed by those of Kentucky and elsewhere who prefer rotary presses for printing scrips in bulk to "rotaries" for washing their diamantiferous ground in quantity. Diamond bearing mines need not necessarily be confined to South Africa. Whether at Hudson Bay territory, Iceland, or the "Blue Grass" country, the associated minerals noted offer opportunity for legitimate exploitation; so the prospective advance in diamonds may induce trans-Atlantic mining men to closely investigate their own fields. Then the South African combination will revise their visiting lists.

For thirty years or thereabout, the diamond-laden craters of Kimberley have yielded gems of "purest ray serene." More recently the Orange River and Transvaal colonies have contributed in varying quantity and quality. The "Diamond Syndicate," of which the pending proposal is an extension designed to assort and sell the diamonds, was contemporaneous with the amalgamation of controlling forces in DeBeers, Kimberley, Wesselton, Bultfontein, DuToitspan and Jagersfontein, constituting the basis of DeBeers Consolidated. Instead of individuals and smaller concerns holding and working claims to more or less disadvantage in these respective mines and forcing their diamonds on to indifferent markets at 18s., 19s. and 20s. per carat, as was the case twenty years ago, Rhodes, Barnato, Wernher, Beit & Company; Rothschild, Ponges, and others, took the DeBeers outputs month by month, or week by week, at contract prices. With minor changes in the personnel of this combination, the syndicate has since so preserved their diamond markets that to-day an average of 70s. per carat is realized. It has cost the public well on to a round hundred millions sterling to bedeck those who will have diamonds, and notwithstanding forebodings lest the supply exceed the popular demand, the annual output has attained a value of about £10,000,000 from South Africa alone. At one time Rhodes thought the world's yearly absorption of diamonds might justify finding £4,000,000 worth. That was when the per carat value was a sovereign and a Cape tax was imminent. Either Rhodes under-estimated the prowess of himself and colleagues or he did not comprehend the persuasive eloquence of American womankind, for his own creation has exceeded his estimate for a twelvemonth by putting out £5,000,000 to £6,000,000 worth. In twenty years the five Kimberley mines have accounted for about 43,000,000 carats, valued at about £70,000,000, to say-nothing of Jagersfontein, the stones from which are also controlled by the Diamond Syndicate, their quality being superfine. If you add the syndicate's profit, and the jeweller's profit, to the £70,000,000 valuation before the diamonds left Kimberley, the calculation that it has cost the public a hundred millions sterling to adorn the fair sex is not wide of the mark. Really these diamonds have been excellent investments. To comprehend this it is necessary only to state that the selling price of DeBeers diamonds has advanced 50 per cent. in the past eighteen months. Those who possessed jewels at previous prices have corresponding consolation.

Until the discovery of the Premier Mine near Pretoria in the Transvaal, the syndicate operating to such advantage in DeBeers diamonds had a free market, easily manipulated; because one or two small producers elsewhere, and alluvial areas on the Vaal River were negligible quantities. The Premier Mine is as large as the combined DeBeers "pipes," and when it demonstrated that its yield was a matter of machinery, the DeBeers Syndicate foresaw difficulties in their markets. Since all mines have low quality diamonds, and the Premier Mine has more of these than others, the mutual plan is to pool everything and uphold selling prices. The technique of diamond dealing is so complicated that a few perfect stones are certain to turn a loss on an average "parcel" into a profit. Consequently it has been accepted by all parties that 200,000 carats per month of Premier Mine diamonds, worth 25s. to 30s. are a menace to choicer asosrtments taken from the mines of Kimberley and Jagersfontein.

Rather than try conclusions with the Premier Mine product—some of which is unexcelled in quality—and precipitate a conflict that would adversely affect the general quality as taken from the DeBeers mines, the Diamond Syndicate consented to the pending negotiations. Obviously the public will "pay the piper," but what does it matter if the diamantiferous contents of craters in payable quantities are confined to South Africa? Not all diamond "pipes" are to be worked profitably. There are "blind" and low grade "pipes," just as there are barren or unpayable reefs, veins or lodes. Rhodes and his associates made diamond mining a science first—a correct principle in all mining—subordinating the speculative element. The yearly output of the DeBeers combination is worth more than Rhodes and others paid to acomplish that combination. The Premier Mine product is worth two and a half millions annually—or 40 times what Cullinan paid Prinsloo for the premises five years ago. A rich man's opportunity is thus presented for the control of diamond markets—until Canada or the States exploit their craters of which some have fallen into the precarious possession of the scrip peddler.

Later mail advices, under date September 19th, confirm the foregoing, although the statement appearing September 17th in the *London Times* that an arrangement between the DeBeers and Premier Diamond Companies for the sale of stones "had been concluded in outlines," is denier. The basis of the negotiations is, that "the output of the two companies will in future be pooled and sold in fixed proportions to the syndicate which at present deals with the DeBeers production only." All the parties concerned are hopeful of a "mutually satisfactory result," and it is believed that the Transvaal Government, which holds 60 per cent. interest in the Premier Mine, will not interpose since the maintenance of market prices for diamonds will favorably affect the profits derivable therefrom. Thus another trust approaches consummation.

A meeting of the Mining Society of McGill University was held at Montreal on Friday, November 8th in the Mining and Metallurgical Building of the University. An interesting paper was presented and read by Mr. Bell, followed by a discussion in which several present participated.

A METHOD OF MINE SURVEYING.

For my own use I have devised the following method of instrumental work and preserving of notes which I find answers the purpose exceedingly.

I think it is particularly free from many of the defects of those methods I have heretofore seen.

The only requirement to the ordinary mining transit is to have the horizontal limb graduated from 0°00′ to 360°00′ in either direction, but preferably to the right, i.e., a rotation to the right through north, neast, south and west increases the angle read by the vernier.

In ordinary work only one vernier is used, but in cases where extremely accurate results are required, as when placing sills on lower levels to catch those on the next higher as in square sets, both verniers are used and the angles doubled. This does not alter the method of entering notes in the record.

Sights wherever possible are taken horizontally, the elevations being run later by means of the telescope bubble and a short levelling rod.

This, of course, applies to the main hubs rather than to the unimportant side points.

In steep sights, or where it is more convenient, the slope, distance and vertical angle are measured.

The field book has five columns. The first contains the numbers at beginning and end of course; column two the deflection angle, column three the distance, and column four the vertical angle if the course is measured along the slope. Finally the fifth column contains the number of the back sight.

To eliminate errors of collimation the telescope is not transited about its hor. axis, nevertheless, although the telescope is turned through the interior angle, it is the deflection angle which is read. This is done by merely setting the vernier at 180° instead of at zero for each reading. Suppose the vernier set at zero, telescope inverted and clamped along the back sight. Turning the telescope about its horizontal axis gives a F. S. exactly 180° from this. Any reading of the vernier will indicate the deflection angle.

If, however, the vernier be set at 180° and a B.S. taken, and the telescope be turned about its vertical axis through 180° it will read 0°00′ and its line of sight will coincide with the former, therefore whatever reading be indicated by the vernier will be the deflection angle.

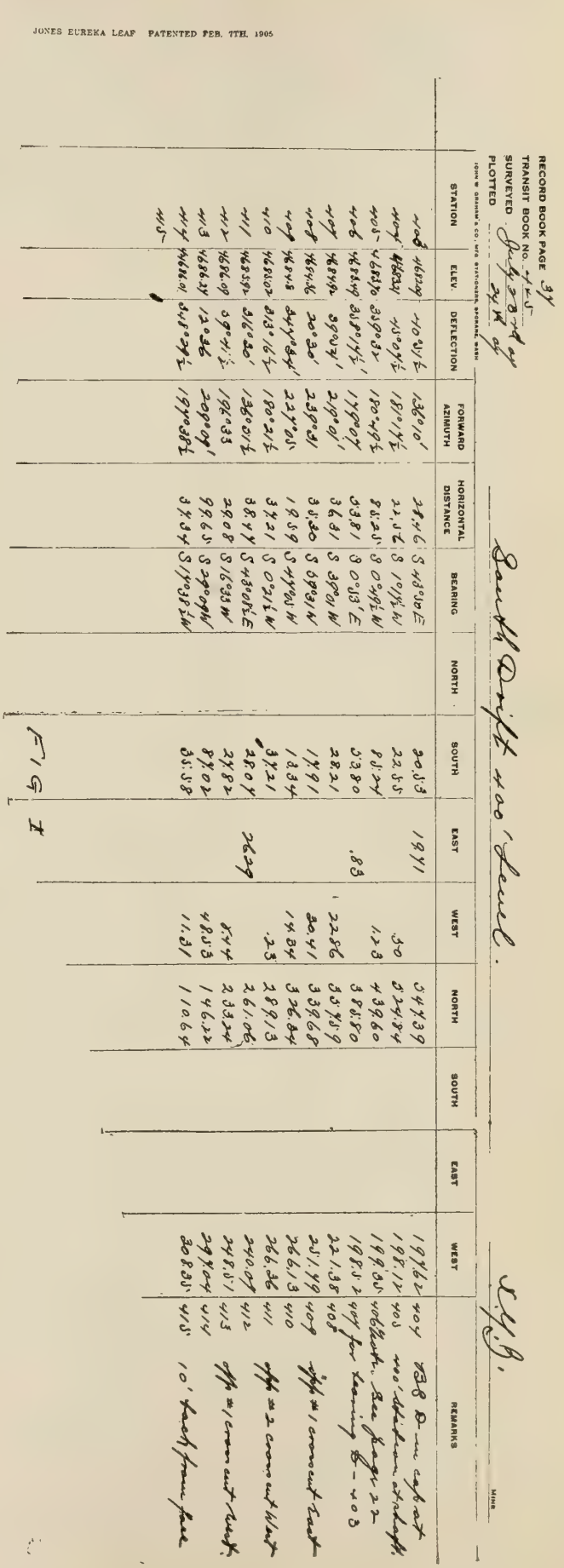
This as stated before eliminates on one reading the collimation errors.

Fig. I. shows a sample page of notes. This page is 8 1-4 by 19 inches, and being of the loose leaf form is contained between solid covers and can be added to or altered without defacing the work.

The station numbers in the first column refer to the beginning of the course on that line, i.e., it is the hub where the instrument is set up. The number in the next column is the elevation of that hub. In the third column the deflection angle as read in the field is entered, directly from field book. The "forward azimuth" of any course is in the fourth column. It is the deflection of the course from a true north line, the quantities in this column being always "the azimuth of the preceeding course plus the deflection of the required course minus 360°, if their sum be greater than 360° thus, example:

Azi 403-404 + deflection 404-405 = Azi 404-405 or

136°10′ + 45°07½ = 181°07½ = Azi 404-405



Again

Azi 405-406 + deflection 406-407 = Azi 406-407 or $180°49\frac{1}{2} + 358°17\frac{1}{2} = 539°07$ = Azi 406-407 and $539°07 - 360° = 179°07$ = Azi 406-407.

Considering these examples, it will be noted at a glance that there is no possibility of error as to the deflection being right or left, an error being apt to occur in small deflections where the method of a ° "left" or "right" is used. Also all collimation error is eliminated.

The sixth column gives the course in terms of the compass, i.e., N, E, S or W, and is derived directly from the forward azimuth column, thus:

Forward Azimuth.	Bearing.
0°00′ to 90°00	N.E.
90°00′ to 180°00	S.E.
180°00 to 270°00	S.W.
270°00′ to 360°00′	N.W.

From this last column the latitude and departure co-ordinates are reduced, and these co-ordinates refer to the hub whose number is in column on "Remarks." (Through a typographical error the proper column for these foresight hubs was omitted.)

As a check, I close the survey on the starting point, using the same hubs but different angles. Only one series of set-ups, however, is required. Suppose the instrument set up on hub 410 B.S. on 409, F.S. on 411 and read deflection angle to 411. Now unclamp, reset at 180°, B.S. on 411 and F.S. to 409, noting deflection either an another page or underneath the previous deflection.

The second deflection should be equal to 360° minus the first. Any error is spotted at once, in the field, and the the method also eliminates the possibility of repeating an error and gives two readings, the mean of which can be accepted as correct.

In making simple connections, running raises, etc., the auxiliary telescope is used as a top scope, but for more accurate work as a side scope, to eliminate slight errors of adjustment of horizontal axis.

In steep sights where the auxiliary is used as a side scope the back sight is taken with the latter, then the foresight made from vernier. This, however, does not give the true azimuth and necessitates some corrections covered by formulae A.

Fig. II. represents instrument set up at D 111 at the collar of shaft, say with the side scope backsighted on D 110, the azimuth or bearing of 110-111 being known the azimuth of line of sight from D 110 through side scope is = azimuth of 110-111 $\mp$ tan an —1 d-D (the minus sign being used when side scope is to right of observer and vice versa) when d = perpendicular distance between telescopes and D the horizontal distance 110-111.

Now turn telescope around both axes; but do not transit; and foresight on 112 through side scope. This deflection added to the azimuth of backsight through side telescope gives the azimuth of foresight through the side scope thus Azi (D 110—D 111) $\mp$ tan d—D + deflection = azi of line of sight through side scope.

The slope distance from centre of telescope at D 111 to D 112 and vertical angle being measured, the horizontal distance D is calculated and the small angle d=d is tan —1 d—D, whence the azimuth D 111—D 112 becomes azi (D 110-111) $\mp$ tan —1—D + deflection $\mp$ tan —1 d—D, the upper or lower signs being used

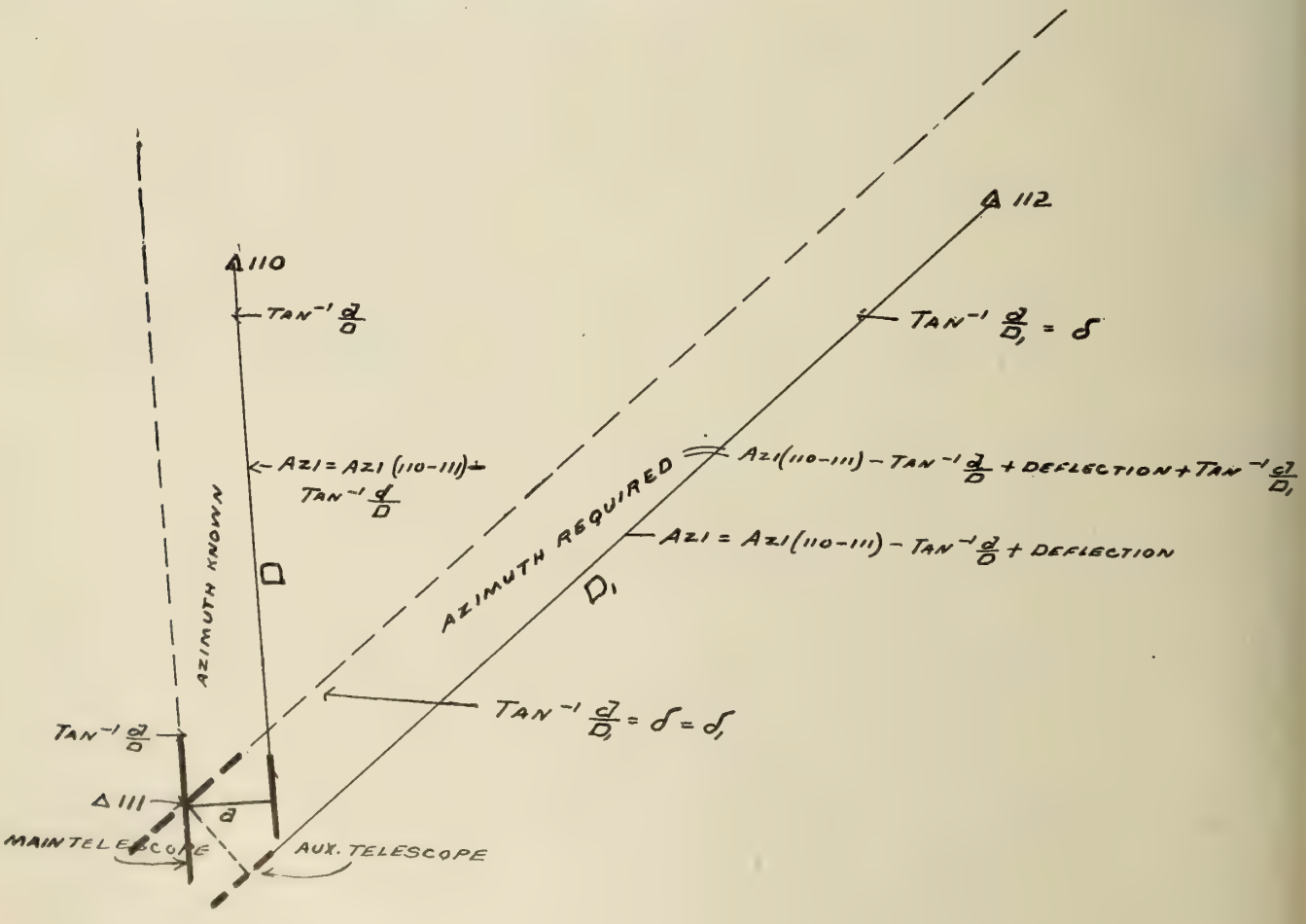


FIG 2.

when side scope is respectively to right or left of observer. This operation is repeated with the horizontal axis at 180° to its fist position.

Extremely accurate results can be had in this way even if the instrument be considerably out of adjustment.

If it is required to run a line from some known hub to some other known hub, the bearing of the line required is calculated from the latitudes and departures of the two hubs. This bearing is converted into azimuth and the deflection from the nearest known hub is the azimuth of the required course minus the azimuth of the preceeding, thus:

Deflection = azimuth course required—azi of course containing back sight.

This method I have no doubt will be familiar to many, though I have never seen it used or described. It is one I devised for my own use as being one less liable to error than any I know of. No doubt it can be expanded or altered to suit special conditions, but personally I find it all to be desired, as it is equally suitable for shaft work drifts, tunnels, stopes and open cuts.

A. B.

EXCHANGES.

The *Colliery Guardian*, October 25th, editorially discusses qualification for coal mine managers' certificates. Whilst certain objections are developed against the interchange of certificates as between the United Kingdom and the rest of the Empire, the *Guardian* does not condemn such reciprocity entirely. It traverses Mr. Stokes' suggestion that three years' service in a mine abroad be taken as equivalent to one year in the United Kingdom.

The *Mining and Scientific Press*, November 2nd, gives a good article on "Jigging by Hand" in Mexico. "Hand jigs can often be effectively and advantageously used in treating dumps of low grade material, without crushing, and with but a very small amount of water, when the material is too fine to be economically sorted by hand." The advantages are summed up thus: (1)Need of a very small amount of water (2) low cost of installation; (3) facility for moving from one place to another.

Writing on pumping machinery employed in mining, in the *Mining World*, November 2nd, Mr. Jos. H. Hart endorses the use of compressed air. "Given an air compressor, the operation of the pump itself is extremely simple. It consists merely in sinking a well to a slightly lower depth to obtain the pressure head with which to operate . . . In ordinary practice the height to which air can be elevated by this process seldom exceeds one and one-half times that to which the water faals in the well without reversal occurring. If the pipe which carries the air and water upward is tapped and more compressed air rejected, the process becomes continuous, and the water can be lifted to any height . . . The air lift process is much more efficient, however, than the ordinary surface pump. It possesses all the advantages of the ordinary single or multiple turbine pump."

Economic Geology, September-October number, presents a fine range of papers. One on the "Precipitation of Copper from Chloride Solutions by Means of Ferrous Chloride" is especially worthy of note. Gustave Fernekes is the writer. A series of analyses of mine waters was made upon samples from different mines at depths ranging from 800 to 5,000 feet. The waters proved to be more or less concentrated solutions of calcium chloride, sodium chloride and sodium bromide, with traces of sulphates. Concentration increased with depth. No copper was deposited by means of ferrous sulphate. The cause of the failure was the fact that metallic copper is soluble in hot dilute hydro-chloric acid. To make precipitation of copper possible the hydrochloric acid must be constantly neutralized. This neutralization can be brought about by the carbonates or silicates of calcium and sodium. Calcium hydroxide was first tried, then calcium carbonate and finally calcium silicate in the form of the mineral wollastonite. The experiments were successful, the copper being deposited in from ten to fifteen minutes' heating at 200 degrees C. Interesting, though tentative, conclusions are reached in the course of the paper.

PERSONAL AND GENERAL

Mr. H. J. Carnegie Williams, manager of the Bruce Mines, Ont., left recently for England.

Mr. T. J. Drummond, of Montreal, sailed for England on the Londonderry Iron Company's business on the 7th inst.

Mr. Jay P. Graves has returned to Spokane from attending the meeting of the Granby Company in New York.

Mr. R. D. Thompson has resigned as superintendent of construction at the Dominion Coal Company's collieries, Glace Bay, N.S.

Mr. W. S. Johnson, of Lachine, Que., is visiting the West on business in connection with his mining interests in the Slocan district.

An examination of the Laurentian gold mine in the Manito udistrict, Ontario, has recently been made by Mr. H. H. Newcomb of Boston.

Mr. William J. Penhallegon has resigned the superintendency of the Manitou Mining Company and the Frontenac Copper Company.

Mr. G. P. Player, late accountant for the Hall Mining & Smelting Company, Nelson, B.C., has opened offices on his own account in that town.

Mr. J. E. Hardman, of Montreal, has recently returned from an examination of an important new iron area in New Brunswick on behalf of clients.

Mr. S. Yamada, a Japanese mining engineer, in charge of an important copper mine in Japan, is visiting the smelters and mines of the Boundary district.

Mr. Anthony J. McMillan, managing director of the LeRoi Company has left Rossland enroute for England, where he will spend the next three months.

Mr. J. K. L. Ross, the new commercial manager of the Dominion Coal Company, graduated from McGill University in 1897 and is a son of Mr. James Ross, of Montreal.

Dr. John H. Banks, of Messrs. Ricketts & Banks, metallurgists, of New York, is preparing a special report on the extraction of metal values from the ores of the Cobalt district.

The report that Mr. Hays Hammond was about to sever his connection with the Messrs. Guggenheims, for whom he is acting in the capacity of advisory engineer is officially denied.

Mr. Alexander McLeod, consulting geologist, has recently returned to Sidney, C.B., from Newfoundland, where he was engaged in examining mineral properties for American clients.

Mr. Fred. Demuth, superintendent of the White Bear mine at Rossland, has denied the report that he is leaving the company's service or that the closing down of the mine is contemplated.

Mr. James S. Quigley, for the past five years underground manager at the Mabou mines, N.S., has accepted an appointment on the engineering staff of the Maritime Company's Joggins mines.

Mr. M. S. Irwin has resigned the secretaryship of the Hastings (B.C.) Exploration and other companies, leaving Nelson recently for California. He is succeeded by his brother, Mr. William Irwin.

Mr. Fred. G. White, until recently accountant at the Cariboo Consolidated, Bullion, B.C., has been appointed manager of a business department of the Yukon Gold Fields Consolidated, at Dawson.

Mr. W. Anderson, for many years superintendent of the Cascade Power & Light Company of Cascade, B.C., has been appointed hydraulic engineer to the West Kootenay Power & Light Company, with headquarters at Rossland.

Mr. Thos. Thompson has resigned as superintendent of the Dominion Iron & Steel Works' open hearth furnaces to accept an appointment in New York. He is succeeded by Mr. James K. Fraser, for some time past senior foreman.

Mr. C. H. Low, a director and secretary of the recently reorganized Payne Mines, Limited, of Sandon, B.C., accompanied by the company's engineer, has just completed an examination of the property, which is to be extensively developed.

Mr. H. Cecil, acting for a British Company proposing to erect a copper smelter on Uchuckleset harbor, near Alberni, B.C., is at present in the West securing estimates and other information to lay before the directors of the company in London.

Mr. T. R. Stockett, manager of the Western Coal Company's collieries at Nanaimo, B.C., in a recent interview stated that labor conditions there were now satisfactory and that the company was now able to maintain a daily output of about 2,400 tons.

Mr. W. J. Prisk, who retired recently from the management of the Dominion Antimony Company's mine at West Gore, N.S., was presented by the president, directors and employees of the company with a gold watch suitably inscribed, in appreciation of his services during his connection with the company.

Mr. A. G. Larsen, superintendent of the LeRoi mine at Rossland, reports that the property is looking exceedingly well, and that shipments are being maintained at the rate of 300 tons a day, which tonnage would not be exceeded until an improvement took place in the copper market conditions.

In a recent interview Mr. R. W. Coulthard, general sales agent of the Crow's Nest Coal Company, stated that two new seams of coal are being opened at the Morrisey, from which it was expected coal would be shipped early next year. The company has recently engaged a number of experienced miners from Wales and Staffordshire to work in the collieries.

Mr. Alexander Dick has resigned as general sales agent of the Dominion Coal Company. The resignation goes into effect on the 1st of May next. Mr. J. K. L. Ross, who has been with the company since 1900, has been appointed commercial manager, and will, it is understood, also have direction of the department at present under Mr. Dick's charge. Mr. Dick's resignation is much regretted.

CORRESPONDENCE.

Phoenix, B.C., Oct. 24th, 1907.

To the Editor,

Canadian Mining Journal, Toronto.

Dear Sir,—Allow me to congratulate you on the stand you have taken in exposing the methods of mining sharks in robbing (no other word fills the bill) the public by the sale of stock in companies owning a few acres of, in all likelihood, barren ground. This refers more particularly to operations on the reputation of Larder Lake.

The many glowing statements of this district, e.g., "Richest gold camp in the world," etc., are not only exaggerations but absolutely false. I spent a large part of last summer in the vicinity of Larder Lake, in fact, my camp was continually within a few yards of it, while working this district. The party consisted of five men, myself and partner (also an engineer), two guides and cook. We were prospecting for a syndicate, and it would be difficult to find a better outfitted party or one in which the work of prospecting was carried out with more method and study, the work of each day being gone over during the evening, all geological data, pro and con, being duly considered.

I can say that the country in which these big (?) finds are being made was pretty well covered either by myself or partner.

Now to the point. I am not at liberty (and even if I were it would not be advisable to make it public without certain qualifying statements) to state my views as to the richness of the district, but this much is a fact: the party disbanded in the fall without staking one single claim, and it was not deemed advisable to do any more work in that district. This conclusion was arrived at on the strength of my report.

I was fortunate enough in preventing many of my friends from losing money by investing in these wild cats, and though I was considered in the light of a pessimist at the time, my opinion has since been fully justified.

I should be much surprised to see anything but Dumpit (a name jocularly applied by miners to wash) come out of the district. Moreover, I am convinced that whatever ore, if any, does come to the mill will be in homeopathic quantities, statements to the contrary notwithstanding.

I remember some time ago reading an advertisement of a company which had a 5 stamp mill on the way to one of its claims. Remember it was "on the way," not on the ground. After several flamboyant and fiery statements, the advertisement stated the desirability of erecting a 200 stamp mill from the proceeds of sale of stock.

At the most there could not have been more than 100 feet of drifting or sinking, and this could not have blocked out much ore (in keeping with the statements of these men there was probably none at all).

Now Mr. Editor, can you conceive of the knavery of men who will deliberately put before the public such barefaced frauds to rob those who have in the course of years saved a few hundred dollars; for these are the ones who are caught. Men with capital who can afford to lose are not tempted by such bait. They know too well that good properties need no advertising to raise money for development. Only those to whom sums of a few hundred dollars appear fortunes are convinced by such, and they are not in a position to find out the actual facts.

Mining is a legitimate profession, and many honorable men are to be classed amongst its members, and if miners do not wish to have the name "Mining Engineer" synonomous with shark it is up to them to discount and expose the practices of these vicious pirates.

It has taken British Columbia many years of uphill work to regain her credit as a mining province, a credit which had been strongly jeopardized by these get-rich-quick leeches. The press of Ontario and Quebec has it within its power to eliminate the tremendous losses to the public and the discredit which must inevitably follow the indiscriminate advertising of fake mining companies.

Yours truly,

LEGITIMATE ENGINEER.

OBITUARY.

Mr. Harvey Graham, assistant general manager and a director of the Nova Scotia Steel & Coal Company, died at New Glasgow on October 31st after a somewhat tedious illness. Mr. Graham had been associated for many years past with industrial enterprises in Nova Scotia, having been manager of the Nova Scotia Glass Company, Black Diamond Coal Company, and New Glasgow Iron & Coal Company up to the time the latter was absorbed by the Nova Scotia Steel & Coal Company. Recently Mr. Graham undertook the task of perfecting arrangements for the development of large iron ore deposits in Brazil.

The death occured near Duncans, Vancouver Island, on the 28th ultimo, of Mr. Clermont Livingston, managing director of the Tyee Copper Company, and a gentleman very highly esteemed and respected throughout the Province of British Columbia, where he resided for fifteen years. Mr. Livingston after acquiring the Tyee mine some years ago first organized a small development company, which was finally merged in a bigger concern, and erected the smelter at Ladysmith, which has been very successfully operated. In the words of one of his contemporaries: "The death of Mr. Livingston is a distinct loss to the mining community. His properties have been the most straightforwardly managed and straightly conducted of any in the Province, and his name has been a synonym for honest dealing. Even when it was against his own interests and that of his company he has not checked the truth, and the result has been that capital at home and abroad has had the fullest measure of confidence in him and his judgment."

The Canadian Mining Institute and the mining industry generally has suffered a severe loss in the death of Mr. John Blue, which occurred on the 2nd inst. at Eustis as a result of an accident. At the time Mr. Blue, while overseeing certain work at the mine, was struck and run over by a water car, sustaining injuries from the effect of which he only lived a few hours. Mr. Blue was born in Scotland, but coming to America as a young man, engaged in engineering work and later was put in charge of important operations in connection with the building of the Hoosac tunnel.

For many years past he has occupied the position of superintendent of the Eustis Mining Company's works, at Eustis, Que., and was one of the charter members of the Institute, on whose Council he has served as a representative of Quebec mining interests and subsequently as a vice-president. At the funeral, which took place on Monday, November 4th, the Canadian Mining Institute was officially represented by Mr. John Penhale. The Institute also sent a wreath of flowers and a telegram of condolence as follows, which was despatched to the widow of the deceased:

Mrs. John Blue, Eustis:—Officers and members of the Canadian Mining Institute desire to express deepest sympathy in your sad bereavement and to record their great regret at the untimely loss of one of their oldest and most respected members.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.—It has often been said that one must leave home to learn the news, and we have learnt some most peculiar news from an article that was recently dished up for the delectation of the innocent readers of the "New York Times." This precious screed is a fair sample of the "guff" with which some papers feed their readers, and it is perhaps hardly worth while quoting except that its very ridiculousness may amuse some of our Glace Bay readers. The effusion in question ran as follows:—

TOPICS OF THE TIMES.

FAME CAME BY MERE LUCK.

"Glace Bay, the name of which—though not its pronunciation has suddenly became known all over such parts of the world as counts, was about the last place that even a long-distance prophet would have picked out for a glorious destiny. All there was to Glace Bay before Mr. Marconi, driven from Newfoundland by the futile jealousy of the cable company, went there was the bay, and the bay itself is a poor thing, as bays go, a mere shallow inward sweep of the Nova Scotia coast, with no protection for ships and therefore no town. Indeed, there is hardly a hamlet—just a thin scattering of mean houses over sterile, rocky hills.

"There is, to be sure, a little station on the disconsolate little branch railway that wanders down from Sidney to Louisburg and serves a few coal mines and sawmills, but one could hardly imagine anybody's stopping there except from stern necessity or staying any longer than the stern necessity compelled. Most parts of Nova Scotia have a rugged beauty, but the region around Glace Bay is only dull—so dull that even the second growth birches and spruces that cover most of it have given up in despair and died before they were worth cutting.

"Had it not been for the fact that Louisburg is just beyond, nobody would ever have even passed through Glace Bay or known of its existence, but as it is, a good many people have given the place a glance, for Louisburg, even though it hasn't much to show the visitor, does remind him of great events and make him wonder why a fortress that cost the King of France unnumbered millions to render impregnable should have fallen as soon as a few companies of New England militiamen made an attack on it. But nothing ever happened at Glace Bay, and, as it dosn't seem any better fitted for a wireless telegraph station than any other spot along that coast, its selection for its high destiny and sure immortality is at least as mysterious as anything connected with the new method of communication.

"As for the pronunciation of the name, it is as simple as possible, with the "a" like that in "race" and no Frenchified toyings with the final "e." At least that's the way the folks living thereabout speak it, and if they do not care to remember its origin there is no reason why anybody else should do so. The name was chosen, doubtless, because any ice that wanted to drift in and accumulate there was free to do it to its heart's contend. The word is English and meaningless now, however, and its fate is only another illustration of the failure of the French to make any lasting mark on the province that cost them so much and was relinquished so reluctantly."

We may give the genius who penned the above some little information that he badly needs. Although according to him "nothing ever happened at Glace Bay," it is a little more than "a little station on a disconsolate little branch railway." That "little branch," which by the way is some 40 miles long, handled last year over 4,000,000 tons of coal; the little hamlet he speaks of is an incorporated town with a population of about 15,000, and the "few mines and sawmills," furnish almost the entire provincial revenue of the Province of Nova Scotia. There is another "little" industry at Sydney, which is altogether indebted to these mines for its existence and profits, we mean the works of the Dominion Iron & Steel Company. The shipping port of the mines is Sydney, and at Sydney, we may say they have the largest colliers afloat, and the most efficient coal piers on this continent.

We have an idea that the gentleman who wrote the article in question, gives the show away, when he comments on the local custom of pronouncing Glace Bay as "Glays Bay." He knows too much not to know more, and perhaps the whole thing is a labored joke. Maybe the scribe was one of those whom Signor Marconi, caused to sit out in a field, where they had a lovely view of the October woods, and a very distant view of the Marconi Towers. Some of these same gentlemen were very sore and passed backhanded compliments to the great Italian in their various sheets. It is possible that one of them hailed from Ney York. There is one germ of truth in the whole article. The writer states that the region around Glace Bay is "dull." We admit it, but has the writer ever heard an old Yorkshire proverb which says: "Where theres muck theres money"? Glace Bay has the full sweep of the Atlantic gales to purify its atmosphere, and while no one ever accused it of being a beautiful place, it has all the scenic distinction of a rugged coast line and a boundless sea front.

Newspaper reporters do offer some remarkable information every now and then, particularly when they venture on technical matters. There is a tradition around Glace Bay, that on the occassion of the Caledonia explosion many years ago, one local paper informed its readers that "the bottom of Caledonia Mine had fallen out." We noticed recently in a newspaper paragraph describing the progress in pumping at the Hub Mine, that "but a comparatively small quantity of water remains in the pit bottom." At this rate there must be quite a lot of water in the deeps yet! At various times these same reporters assure the country that such and such mine is either nearing its finish, or that it has still many years to run. These estimates it is strange to contemplate vary with the politics of the newspaper, and they are given quite gratuitously and free of charge. However, they are not worth anything. Everybody must have noticed that whenever a news paper reports an occurrence with which they are quite familiar, the report is incorrect in some particular or other. Yet every other occurrence reported in that paper, we accept as gospel, so great is the respect born in us for the printed word. The probabilities are that they are no more correctly reported, than the occurrences we happen to know about.

As was anticipated the output of the Dominion Coal Company's mines for October, was the largest of the year, being a little over 342,000 tons. The output for October last year was 350,000 tons, notwithstanding the fact that on the 21st the reserve bankhead was burnt down. Had the Hub Mine been working this October, the output would easily have been the largest on record for the Coal Company's mines. The labor situation is easier owing to the fact that the picnic season is over, and that men are returning to the mines from their farms, and from Newfoundland. There will be no slacking in outputs till the end of November, and coal is being shipped up the St. Lawrence at a great rate. Shipments will be continued as late as possible.

Following on the appointment of District Superintendents, by the Coal Company, is the appointment of Mr. James D. Maxwell to the position of manager of Nos. 2 and 9 Collieries. Mr. Maxwell was formerly assistant manager of No. 2 Colliery, and has for some little time back been the manager of International Colliery. His place at International will be taken by Mr. Bart. Connors, late assistant manager of Reserve. Mr. William Wilson, has been appointed to the management of the Hub Mine—No. 7—in place of Mr. Robt. Robertson, resigned. Mr. Wilson was for some time underground manager of No. 7, and has lately been engaged as coal inspector for the whole of the Coal Company's mines.

Mr J. K. L. Ross, the son of President James Ross, has been appointed commercial manager of the Dominion Coal Company, at Glace Bay, with charge of the commercial operations of the company, including the shipping, sales, railway and stores departments.

The contract for the grading of the Victoria Branch of the Sydney & Louisburg Railway has been given to the Lindsay Construction Company, who recently completed a contract on the Halifax & South Western Railway. They have leased the Grand Lake Hotel, and are already vigorously pushing the work. Up to date about two miles of right of way has been cleared, and grading has been commenced at three points on the line of route.

The vagaries of the Stock Market are beyond the understanding of the average man. Why should Dominion Coal drop to 37 and Dominion Steel to 13, when both concerns are getting bigger outputs, and if payrolls and shipments are any indication, are in better condition than ever before? Stock market quotations do not seem to be much of an index to the actual health of industrial concerns.

The Dominion Coal Company have let contracts for 100 miners houses in the No. 2 district. These houses will all be completed in time for occupation next spring, when No. 2, 9 and 7 mines will be putting out about 120,000 tons a month. In October No. 2 bankhead dealt with over 100,00 tons of coal, quite a respectable performance. The erection of four new Babcock & Wilcox boilers has been commenced at this colliery to meet the increased demands for power neccesitated by the recent additions of electrical generating plant.

The North Atlantic Collieries Company are making steady progress at Port Morien. General repairs have been made of the houses and plant. About fifty men are at present engaged at the patchedmine and the daily output is about 150 tons. New boilers, and a new smoke-stack have been installed, and a new haulage rope put on. The first shipments made by the new company were dispatched in October, some 100 tons being sent to Newfoundland and 600 tons to Quebec.

The Dominion Iron & Steel Company, according to a report that appeared in the "Sydney Record" of 19th Oct., have leased the areas of the New Brunswick Iron Company, at point Lepreaux, N.B. The lease is for eighty years, on a royalty masis of 25 cents per ton. The directors of the New Brunswick Iron Company, are as follows: C. V. Wetmore, John S. McLennan, F. P. Jones and F. A. Crowell, of Sydney and Jas F. Robertson, of St. John. The Steel Company will develop the property, and ship ore to Sydney for use in their works.

ONTARIO.

COBALT.—There has been another rich strike of silver on the Silver Leaf, causing renewed interest in this property, which has improved rapidly the last few months.

The McKinley-Darragh are shipping some very rich ore; returns from a 25 ton car produced pure silver, 61,200 oz. Smelter charges were $400.00 per ton, freight charges $25.00 per ton, mining expenses averaging $60.00 per ton, total $485.00 per ton. This makes a net profit of $49,075.00.

The Temiskaming & Hudson Bay Mining Company are building extensively on their property adjoining Trethewey. A large sleeping camp is nearly completed.

The men at the Badger Mine went out on strike the other day, the management having returned to the 10 hour a day. New men were at once employed. There are too many idle men in the camp at present for a strike to have any effect.

Cross cutting at the 85 foot level, the Cobalt Lake Mining Company struck their "Niccolite" vein. Here it averages over 28 inches in width, and carries much higher cobalt values than at the surface. This is in all probability the most wonderful vein of its kind known. On vein No. 4 of this property, they have again found rich Argentite and Native Silver values.

SILVER BIRD.—About one mile and a quarter to the northeast of Cobalt town and adjoining Bucke Township, is the Silver Bird property. On a visit to this prospect, we found that operations had been suspended.

The property consists mostly of swamp land, the geology of the rock formation is difficult to determine, as there are few, if any, rock exposures being covered by heavy "drift." Doubtless during their operations they discovered rock, as a rock heap of some dimensions was found at the shaft-house, which was built on a slightly elevated piece of ground overlooking a small creek.

The buildings consists of shaft-house, boiler-house, small though comfortable sleeping camp, besides one or two other small buildings.

It is evident that the management had great faith in the camp, having to sink through such a depth of drift. Prospecting for veins had to be done by cross-cutting, undeniably a very expensive operation. Evidently, as the work has ceased, no "pay vein" was encoountered.

This property at one time in its history was famous on account of the extent and character of the advertising given to the stock, which was placed on the market seemingly at a very low figure; much energy being displayed by the brokers who handled it in the construction of the advertisements.

"See Silver Bird Fly." Has it flown?

ALBERTA.

Mr. Sherman interviewed gave out the following statement: "The final sitting of the board has resulted in a disagreement, as, on behalf of the men I represent I could not possably agree to the report, which will be forwarded to the Government, as adopted by Mr. Fisher and Mr. Macdonald. They will draw up their own report and send it in, and I will send a very different conclusion. The Government will consider the evidence taken on the case and thresh the matter out. Regarding the mines at Hillcrest, it is now up to them. They can strike if they want to or they can continue work, but I will certainly refuse to recommend the report to them, as made by Messrs. Fisher and Macdonald, I cannot give at present any details of the disagreement, as both reports will have to be sent to the Minister of Labor first. Afterwards they will be given out."

HILLCREST.—The conciliation board under the Lemieux Act, appointed to investigate and report on the labor trouble at the Hillcrest Mine near Frank, has held its final session. The board which consists of Hon. C. W. Fisher, the chairman and J. R. MacDonald representing the operators, and F. H. Sherman representing the United Mine Workers of America, could not arrive at an unanimous verdict. Messrs. Fisher and Macdonald made the report, which will be presented to the Minister of Lobar, without Mr. Sherman's signature. The board had a long conference disucssing the evidence taken at the previous sessions, but after many hours of work they found they could not agree, and the meeting adjourned. Mr. Sherman immediately left for Calgary, while Mr. Macdonald remained to draw up the report to be presented to the Government, as drafted by Mr. Fisher and himself.

The Hillcrest Coal & Coke Company were fined $200.00 and costs, at Frank, for locking out about a hundred of their miners, while the Arbitration Board was sitting for the purpose of trying to bring about a settlement of the dispute between the company and the men.

The company closed down their mines and posted a notice requesting their employees to accept the company's terms or remain idle. This the miners claimed was a breach of the Lemieux Act. The men instituted proceedings against the company and obtained a conviction. This is the first conviction under the Lemieux Act obtained in the West, if not, in the whole of Canada.

Hillcrest is a mining camp lying about 3 miles, in a easterly direction from the town of Frank. The camp is tapped by a spur line from the Crow's Nest branch of the C.P.R. The principal seam of coal at present being mined, is about 15 feet in thickness, and is a high grade steam coal. The C.P.R. has contracted for a large quantity of the output from the Hillcrest mines.

Labor troubles have been going on at the mines more or less for the past 8 months, and have been brought to a head by the present disagreement.

The Hillcrest Coal & Coke Company is one of the few companies, which has not joined the Western Coal Operators Association.

HOSMER, B.C.—The Board of Investigation appointed under the Lemieux Act, to report on the labor troubles at Hosmer have concluded their investigation, and have forwarded a unanimous report to the Minister of Labor. A few minor points were conceded on both sides, and representatives of the company and of the workmen came together and amicably threshed out several points with the result that a satisfactory basis for agreement was reached. The board consisted of Judge Wilson, chairman; F. B. Smith the company's representative and F. H. Sherman the representative of the workmen.

BRITISH COLUMBIA.

THE KOOTENAYS.—The recent fluctuations in the price of copper and silver have affected this district in a more or less degree during the past fortnight. At the present writing copper is slowly climbing back up the hill of higher prices and with it the spirit of the district is taking on a more elevated feeling. A few days ago when copper made the lowest point it has seen in a long time, things looked really seriuos for the copper mines of this country, but with the price of the red metal ascending, affairs look brighter just now. Copper need not sell at an abnormal figure to enable the mines of this section to work at a fair profit. While most of the ore is low grade, mining on a large scale, as we are doing at the present time, will place the mines in a position where they can realize a good profit and continue successful operation, if copper sells at anywhere near a general market price, say, sixteen to eighteen cents per pound.

It is obvious even to the cursory observer that monetary conditions will have to be much more serious than they are at the present time, to precipitate anything in the nature of a panic here in the West. In this district the business men are meeting their obligations promptly, and are enjoying a good steady trade.

Taking everything into consideration, the mines and smelters operating at a fair profit, the merchants doing a steady business and the general population with plenty of money on hand, it looks as though the affairs of this district would show up well on the balance sheet at the end of the year.

The big mines are working steadily at Rossland, but there is a small surplus of labor. This is principally caused by many of the old timers and quite a few new miners coming here from the Butte and other districts, where the copper mines have temporarily ceased to operate. Upon the renewal of activities at some of the Butte mines recently, many of the miners who were in a position to do so returned to that point to get back their old positions.

The White Bear Mine has closed down, temporarily it is stated, and it is not known when they may resume work. The pumps have been taken from the mine and it will be allowed to fill with water. It is a much more economical operation to allow the mine to fill with water, provided they may be idle two months or more, than to pump steadily, as the mine when full of water can be pumped dry for the same sum that it would take to keep the water out for a month.

The Consolidated Mines are shipping approximately 4,000 tons of ore per week and Le Roi about 2,000 tons. These are good average shipments and may be materially increased in the future, on the part of Le Roi Company, anyway. Development work on the Consolidated property is being earnestly pursued and the showing on the Idaho claim continues to improve as depth is gained. The workings on this claim, from the surface, are now down over 200 feet in depth. The new motor and rope driven compressor, which was recently started up, is running smoothly now and doing good work. This type of a drive is a great improvement, both from an efficient and economical point of view, over the old steam driven compressor, electrical motor power costing here approximately $34.00 per annum.

Mr. Thos. Kiddie, well known throughout this country, has been appointed manager of the Northport smelter, vice Albert J. Goodell, who recently resigned. Mr. Kiddie will relieve Mr. Goodell on December first, when the latter will leave for Marysville, B. C. to take charge of the smelter of the Sullivan Group Mining Company, at that point.

Mr. Kiddie is known as a capable man and has done much good work in the Province. He designed and erected the smelter of the Tyee Copper Company, at Ladysmith, and operated it until he assumed charge of the Britannia Smelting Company's works at Crofton. He leaves the service of the Alaska Smelting & Refining Company, of Hadley, Alaska, to come here. The successful smelting of Rossland ores is a task that requires earnest application and Mr. Kiddie will find plenty of that work here, which delights the heart of the specialist. There has been much discussion indulged in as to whether Le Roi ores can be smelted cheaper at the plant of the Consolidated people at Trail, B. C., than they can be treated at Northport. The late management at Northport claim that they beat the Trail figures. Contrariwise, the advocates of Trail smelting have things to say in a different light. So Mr. Kiddie will have an excellent opportunity to do some good work at Northport for Le Roi Company.

The Japanese have been quick enough to recognize to true worth of the copper deposits of British Columbia, and have acquired large interests on the Coast, at Ikeda Bay, Moresby Island, where they have a large force at work. It is humorously stated that there is only one white man on the job, and he drives a horse. Mr. S. Yamada, consulting engineer for these people, passed through this district a few days ago. One could not help but note the assiduity of this Japanese engineer, when inspecting the mines. He did not see much of any of the properties outside of the Consolidated, and he only investigated certain work at that property. He delved deep on special features, such as drifting, sinking, etc.

Owing to the reaction in the price of copper, wages may be placed back on the old scale, in the Boundary District, in the next few days. If so, it is very likely that Rossland will fall in line.

In the Boundary District the Dominion Copper Company's plant still remains idle, awaiting word from the officials of the company. Sufficient steam is being made to keep the pumps going, but that is all. The general feeling in the Boundary, is that the Dominion Copper shut-down will be of, but short duration.

There are rumors of an amalgamation of the Dominion Copper and British Columbia Copper interests. A consolidation of these two concerns would be a money making venture, from more than one point of view.

The big mines in the Boundary are not doing as much development work just at present, as they were a few weeks ago, hence they are not employing as many men in their mines. However, the ore shipments are being maintained at a steady output, and outside of the Dominion Copper Company, the district is busy and working along as usual.

The Granby Mines are shipping about 3,000 tons per day to its Grand Forks smelter; the Mother Lode Mine (B. C. Copper Company), is shipping from 500 to 600 tons per day to their own smelter at Greenwood; and the Snowshoe Mine, Phœnix (Consolidated Company), is shipping a large output to both the B. C. Copper Company and Trail smelters. The total shipments from the Boundary for the week ended Nov. 2nd, were 30,739 tons; total for the year to date 1,087,587 tons.

Comparing these figures with the Rossland output, one recognizes the importance of the Boundary District: Shipped from from Rossland during the same week 6,465 tons, and for the year 229,284 tons. But this output will be materially increased in the future.

The Providence Mining Company, operating the high grade Providence Mine, at Greenwood, held their annual meeting in Greenwood about ten days ago. The old officers were re-elected, and an issue of bonds to the extent of $50,000.00 was authorized. These bonds will bear 6 percent. interest and the proceeds will be used to sink the workings to the 1,000 foot level.

The Maple Leaf Mine, at Franklin, up the Kettle River from Grand Forks, has closed down for the season. This will leave the camp practically deserted for the winter. There are some excellent showings at Franklin camp, and Mr. F. Aug. Heinze had a bond on some properties there. The people of Grand Forks are wondering if Mr. Heinze will now have time and money enough to take up his bond.

The Princeton Liberal Association has been making overtures to the Government with a view to having the platinum fields of the Tulameen district examined by one of the geologists of the Dominion Geological Department. They have been given to understand that an effort will be made to meet their wishes in the premises. Platinum has been known to exist in this district for a long time, and an official report on the deposits would be of great value to the many who are at present interested.

In the Slocan a good strike of ore has been made on the Highland Light claim at Eight Mile, and it is also reported that the Ottawa Company has made a strike of importance in the long tunnel that they are driving on their property.

Things are going along in the Ymir District. The Queen Mine is showing up some good ore and work is being done along the usual lines. A rich strike of free milling gold ore, has just been made on the Devlin group, which is close to the Queen. There are some who predict that the Ymir District has not seen its best days yet. There are many properties with excellent showings in that district, and it certainly looks as though there should be some good mines, where the indications are so good.

The Hewitt Company is putting in a new electro-cyanide process, devised by a Spokane man. It is claimed that this process will make a saving of approximately 90 per cent. in the tailings,

the usual saving being about 70 per cent. If Professor Parks' process will save 90 per cent. he will have placed a device in the hands of the milling people that will be worth millions of dollars to them, and he will incidently reap a golden harvest himself, for there is hardly a milling plant in the country, but is sustaining a heavy loss in this direction at the present time.

Three additional furnaces are to be installed at the Sullivan Group Mining Company's smelter, at Marysville, B. C. The present plant has a capacity of about 120 tons per day. The mine is shipping about all the ore the smelter can handle. A new strike has been made on the 100 foot level of the mine, assaying from 60 to 70 per cent. lead, silver 1-2 ounce to one per cent. lead. Between 50 and 60 men are employed at the mine and considerable development work has been laid out for the near future.

It is rumored that A. I. Goodell, recently resigned from the Northport Smelter, will assume charge of the Marysville Smelter. Mr. Goodell is a man who has had a life long experience with the treatment of lead-silver ores and would be an invaluable man to the Sullivan people.

The board that is arbitrating the differences between the employers and employees of the St. Eugene Mine, Moyie (Consolidated Company), will meet at Nelson, B. C. on Nov. 6th, and go into the matter at further length. In view of the decline in the prices of silver and lead it is hardly expected that the demands of the employees can be acceded to—but we will know more about this anon.

The Hillcrest Coal & Coke Company, Hillcrest, Alberta, have recently been fined $200.00 under the Lemieux Act, for locking out a hundred or so of their miners, while the dispute between the company and the men was being arbitrated. The Hillcrest Company, has had a lot of trouble with its men, and it would seem that it was about time they got together and settled theid differences quickly and got down to hard work.

Mr. D. Davies, Comptroller for the Crows Nest Pass Coal Company, Fernie, for some time past, has resigned and will be succeeded by A. Klauer, erstwhile chief clerk in the Fernie office.

Mr. R. G. Drinnan, general superintendent of the Crows Nest Pass Company's mines, has also resigned and will go to Hosmer, there to succeed Mr. John Brown. Mr. Drinnan is a man who has spent the greater part of his life at coal mining and knows every round of the ladder. Mr. Drinnan will be an important factor in the opening up of 4,000 acres of coal land at Hosmer by the C. P. R. Company. The machinery is being installed at the present time to begin the work with. It is stated that the C.P.R. will produce coal in a year, on such a scale as will augment the production of the Northwestern Canadian coal fields to 1,000,000 tons per year. This with the many other properties that will be producing in the next year or two will place the country for hundreds of miles around, far beyond the pale of such a thing as a coal famine.

The C. P. R. has had an agreement with the Crows Nest Pass Coal Company, not to compete in coal production for 10 years from 1899, but the latter company will be only to glad to have them start in now, two years ahead of the agreed time, to help relieve the situation.

Nov. 5th, 1907.

GENERAL MINING NEWS

NOVA SCOTIA.

ANTIGONISH.—Under the supervision of Mr. George Corbett, a two mile road is being built to the Arisag iron mines. Tunnelling will be started as soon as the road is completed. Mr. Corbett intends spending a considerable amount of money on the property.

SYDNEY MINES.—In a short time coal will be conveyed from the new colliery of the Nova Scotia Steel & Coal Company, known as No. 4. Already the two and a quarter-mile branch railway, which will connect the new mine with the rest of the company's works, is about finished, so far as ballasting is concerned, and the moment the connection is completed, much is expected of No. 4. Next week work will be commenced for the erection of a new bank-head. At present there is at least two thousand tons of coal on the bank, which will be quickly used up once the line is connected by railway.

The month of October will go down in history as a record one, so far as the Nova Scotia Steel and Coal Company is concerned, in the output of its collieries and blast furnaces. Although men employed on the big works lost considerable time at the beginning of the month, latterly a decided change has taken place in the number of men showing up to wark after pay days. As a result of this steadiness on the part of the men, last month's output of the different collieries, not including No. 4, exceeded the month of September by nearly nine thousand tons. Following are the figures for October:

No. 1	24,256 tons
No. 3	26,256 tons
No. 5	6,599 tons

This gives a total of 57,071 tons against 48,656 for September, an increase of 8,415 tons.

In the steel department the same degree of activity prevailed, there being an increase over the previous month in every department. The output of pig iron was 5,755 tons, increase of 300 tons over month of September; steal output reached 6,986, being no less than 1,476 tons more than in September; while 8,772 tons of coke was produced, being 1,100 tons more than in the previous thirty days.

SYDNEY.—The survey of the shore line from Sydney Mines to Point Aconi, has been begun. The Steel Company claim a right of way through the Coal Company's areas via the Burchell property, to reach their submarine areas. This the Coal Company dispute.

GLACE BAY.—Mr. J. K. L. Ross has been appointed commercial manager for the Dominion Coal Company.

Mr. Alexander Dick, has resigned his position as sales agent. His resignation will take effect nevt April.

HALIFAX.—The formal order for judgment in the Steel-Coal case was taken out by the Steel Company's solicitors, on Saturday, before Judge Longley. The defendant Coal Company has ten days within which to give notice of appeal.

In the decree the Judge declined to formulate his findings of fact, or to state the basis on which he required the contract to be specificially performed.

The defendants asked that the specific findings of fact be put on the face of the judgment, and if the contract was to be specificially performed that the judgment should state what the Judge holds, the contract required as to quality.

The plaintiffs opposed having any findings of fact formulated or the Judge's interpretation of the contract stated.

Further directions are rescinded, and it is not known at present whether the Coal Company will be required during the 95 years to get out of the seam the Steel Company names, suitable coal, whether it is there or not, paying damages if it is not there, or what effort the Coal Company will be required to make to find

out if it is there in order to purge the attempt involved in not obeying the order.

Neither is any limit on sulphur contents yet stated. The per centage of sulphur in the coal, which renders it unfit for metallurgical purposes depends upon the percentage of sulphur in the iron ore and the limestone used by the Steel Company, and if the sulphur contents in the supply of these ingredients increase, the decree may involve a command to the Coal Company to mine from the seam named by the Steel Company, coal very much less in sulphur than any coal heretofore mined.

NEW BRUNSWICK.

FREDERICTON.—The Londonderry Iron & Mining Company have secured a lease of iron mining areas, eleven miles from Bathurst, ner the Nepisiquit River. A branch railway is to be built to Bathurst. The local Government is to receive a royalty of 5 cents per ton on all ore mined. The iron ore deposits are in the county of Gloucester, and will probably be known by that name.

ONTARIO.

COBALT.—At the annual meeting of the shareholders of the Foster Cobalt Mining Company, Mr. Frank Loring, their consulting mining engineer presented the following report of progress:—

On vein No. 1 shaft 45 feet was sunk, showing two to five inches of Cobalt ore for the entire depth. At vein No. 5 considerable high grade ore was extracted from the surface, as well as between it and the 75-foot level. The stope, which is 125 feet long above this level, and extends to an extreme height of 40 feet, has been mined, and the top of it has been connected with the surface by a shaft.

The stope on vein No. 6 has been continued towards the surface and southwesterly for a distance of 15 feet.

On vein No. 7 a drift 15 feet long has been driven from the 70-foot level of No. 5 vein. The face shows three inches of smaltite, and a well defined fissure. A drift has been constructed to the northeastward from the 70-foot level of shaft No. 5 on vein No. 8, exposing as much as 12 inches of Cobalt ore high in silver. This is now the best showing on the property, being indeed one of the most excellent ever developed on the mine, and it should be a large producer. Veins Nos. 7 and 8 will probably come together.

On vein No. 11 a drift 40 feet long has been made to the northeastward, from the 70-foot level of vein No. 5. Three streaks of Cobalt ore, aggregating four inches in width, have been exposed.

No. 5 shaft has been sunk 85 feet below the 70-foot level, and at 65 feet a new level has been started. The prospect is promising that extensive bodies of high grade ore will be encountered.

A rumour is going around that Silver Leaf, Nova Scotia and Keer Lake properties are to be amalgamated. The last named mine was bought from the Ontario Government originally, for $312,000. Whether there is truth in the report or not, it is easy to say. But no doubt an amalgamation would be most advantageous.

The new strike in the Cobalt Lake property, is more than two feet in width. It was made in a cross-cut, north from No. 4 shaft. The vein is largely smaltite and niccolite.

An electric railway is projected between Haileybury and Cobalt.

The Rothschild's mine at Cobalt has been turned over to the owners of the Kerr Lake mine, on a lease and bond similar to the system of many deals in the western camps. It is reported the sale price is to be $150.000, the option to run six months, and the operators agree to spend $30,000 indevelopment work in the meantime. A large force has been employed doing surface prospecting. This will be continued during the open weather, and during the winter extensive work will be done on the property with diamond drills.

The annual meeting of the shareholders of the Trethewey Silver Cobalt Company was held on the afternoon of Nov. 5th, and though a large number were present, the session lasted but a short time. No changes were made in the officers or in the Board of Directors. Some questions were asked about the dividend, but the answers were indefinite, no promises being made, though it was admitted that prospects looked quite bright. It was explained that ore shipments were being kept back because of unsatisfactory arrangements with United States smelters. It was stated that one smelting company actually desired $300 a ton to smelt ore, which was much higher than previously. It was intimated at the meeting that the company was holding back until the completion of the Deloro smelter in Hastings County, when shipments would be made there. The question of a concentrator is still under consideration on the part of the Trethewey management.

Cobalt's output for October, 1,124 tons sets a monthly record. Ten mines shipped during the month. La Rose and McKinley are the leaders. The camp's output for this year is estimated at over $7,000,000.

The annual statement of the Foster Mining Company, presented at the general meeting of shareholders held in Toronto on November 6th, shows a cash reserve of $63,00. The present board took charge in May. Of the 100,000 shares of treasury stock authorized to be sold last June, 15,585 shares have been sold, at 75 cents per share. Expenses have been curtailed and the company is reported to be sound and strong financially. Shaft No. 5 is down 140 feet. On the 140-foot level veins No. 1 and No. 2 have been drifted on. From No. 8 vein, composed of smaltite and native silver, a car load of high grade ore has been shipped recently.

SAULT STE. MARIE.—The ercetion of a large smelter at or near Sault Ste. Marie, is projected by the Canadian Smelting & Refining Company. The proposed capacity of the smelter is 150 tons. It will treat cobalt, nickle and copper ores. We notice the name of A. G. Penman, the promoter of the Cobalt Silver Mountain Mining Company, among those interested in the scheme. It would be well for Mr. Penman to devote his energies to pulling his Cobalt scheme out of the bog, before indulging in any more appeals to the public.

PORT ARTHUR.—Colonel Shaw, who holds 20 claims in the Silver Mountain District, has put in some development work on his claims. He reports a 6-foot vein on R. 65.

A large pump has been installed at the Beaver Mine. The mine in now unwatered. There are 40,000 pounds of ore ready for shipment.

ALBERTA.

LETHBRIDGE.—The Hillcrest Coal & Coke Company was fined $200. and costs for locking out miners while an arbitration board was sitting, thus violating the Lemieux Act.

BRITISH COLUMBIA.

FERNIE.—A landslide occurred over No. 9 mine at Coal Creek, in the last week of October. The slide was very light. There is no danger of a serious accident.

With the $700,000 received from the Granby Consolidated Company for stock, the Crow's Nest Pass Company will increase its output from 2,500 to 7,000 tons per day. The Granby Coompany is prepared greatly to increase its smelter capacity as soon as it is assured of a supply of 1,200 tons of coke per day from the Crow's Nest Pass Company, equivalent to 2,000 tons of coal per day.

VANCOUVER.—Mr. Thomas Kiddie, who designed and erected the Tyee Copper Company's smelter at Landysmith, and who has

been successively manager of the Britannia Smelting Company's works, at Crofton, and of the Alaska Smelting & Refining Company's smelter, at Hadley, Alaska, has been appointed to the management of the smelting works of the Northport Smelting & Refining Company at Northport, Washington. The Northport smelter consists of six furnaces. It is situated 10 miles from the international boundary and 18 miles from Rossland. The plant is actually owned and operated by the Le Roi Mining Company.

BOUNDARY.—Although the force at the Mother Lode Mine has been reduced by about 50 men, the output of ore has not fallen off.

A new crusher is to be installed at the B. C. Copper Company's smelter in Greenwood. It will be like the crusher now in use at the Granby mines and will be operated by an electric motor of 100 h.p.

ATLIN.—The Ottter Hydraulic Gold Mines Company suspended work for the season on October 12th. During the season 2,000 feet of flume and ditching has been made, giving a head of 150 feet. The ditch has a carrying capacity of over 2,500 inches. The dam, six miles from Surprise Lake, is 75 feet long and 12 feet high.

YUKON.

DAWSON.—The individual claimowners in the Dawson district have asked Commissioner Henderson to make representations to the Minister of the Interior, with a view to securing relief in the matter of water supply. It is stated that the Guggenheims hold possession of all water rights. This acts very detrimentally to private operators of placer ground.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

The text of a Royal warrant, by which the King institutes a new medal to be awarded in recognition of heroic acts performed by miners and others who endanger their own lives in saving or endeavoring to save life from peril in mines or quarries within the Empire, is published in a recent issue of the "London Gazette." The medal will be of two classes, which shall be designated and styled the Edward medal of the first and second class. The first will consist of a circular medal of silver with His Majesty's effigy on the observe, and on the reverse a design representing the rescue of a miner, with the inscription "For Courage." The second medal will consist of a circular medal of bronze of similar design. The new medals will only be awarded to those who, while rescuing or attempting to rescue others, endanger their own lives, and will be made on the recommendation only of the Home Secretary. When acts of gallantry are performed by one upon whom the decoration has already been conferred, such acts may be recorded by bars attached to the ribbon.

Statistics of British steel output for the first half of 1907, compiled by the *Iron and Steel Trades Journal*, show an advance in both the great categories of steel production. Thus the make-up of open hearth steel has increased from 2,196,853 tons in the first half of 1906 to 2,337,794 tons in the first half of 1907, while the make of Bessemer steel has increased from 919,620 tons to 1,068,-972 tons.

Some interesting information is afforded in Part II. of the General Report and Statistics Relating to Mines and Quarries for 1906, a recently issued blue book. Here we find that the total value of minerals raised in the United Kingdom during the year amounted to £105,842,992, a considerable increase over 1905, largely attributable to the increased output and advance of price in coal, whereof no less than 251,067,628 tons, valued at £91,529,-266, was produced. The output of iron ore showed an increase ployed under the Quarries' Act at mines and quarries during the of 909,703 tons, while increases are also reported in the production of copper, lead and tin. The total number of persons em-year was 1,004,092. The loss of life from accidents was 1,275.

In a book, about to be published by *The Mining Journa* (London), entitled "A Key to Cornish Mining," the author, Mr. E. W. Meyerstein, postulates: (1) That no mine has ever been worked out; (2) the deepest mine in the country, after 150 years, has only attained a depth of 3,000 feet, and there finds ore far above the average grade of the country; (3) that the majority of mines have only been scatched, and that at shallow depth.

GERMANY.

A Consular report states that Germany lays claim to the largest labor organization in the world, embracing as it does over four hundred thousand workers, and includes practically every branch of the metal-working industry. Last year this vast union collected funds to the amount of £376,000.

NORWAY.

The British Consul at Christiania reports that the Sydvaranger Iron Company, which owns large iron areas in South Varanger, are building a railway to the port of Kirkenas, where ore will be loaded into ships' holds. The ore to be exported will be treated by the Gustaf Gronsberg process. The present average metallic content is 37 per cent., but by this process it will be made into briquettes ranging from 66 to 68 per cent. iron. Arrangements are being made for a production of from six to nine hundred tons annually.

SPAIN.

The directors of the Rio Tinto have issued an interim report upon the company's operations during the current year. This states that the deliveries of pyrites have been rather below the average in the United Kingdom, but that continental consumption has been higher. Notwithstanding the scarcity of water from prolonged drought, the company's output of fine copper will be only from one to two thousand tons short of the 1906 production. The directors have declared a dividend for the half year ending June 30th of 2s. 6d. per share on the 5 per cent. preference shares, and an interim dividend of 47s. 6d. per share, free of income tax, on the ordinary shares, payable Nov. 1st.

UNITED STATES.

The report of the Alaska-Treadwell Company for the year ending May 31st last shows net earnings of $625,595 from 702,953 tons milled. The total receipts per ton are given as $2.2658, while costs are shown as $1.3759. The average assay value of the ore is $2.42, and the average saving $2.15. The mine development included 197 feet of sinking and 9,200 feet of other development work. The estimate of ore reserves aggregates a tonnage of 4,-982,883, including broken ore in stopes. The company has two mills, one of 240 stamps and the other of 300 stamps. The loss

of quicksilver in amalgamation was 35.2 per cent. in the 240 stamp mill and 32.5 per cent. in the 300 stamp mill. The average number of men employed was 493.3, and the average wage paid $3.23 per day.

The condition of the copper market is responsible for the suspension of operations in the erection of the large copper smelter at Coram, Shasta County, California, which had almost been completed. In Butte conditions seem to have settled down, the miners having agreed to a reduction of fifty cents a day in wages.

At Elko, in Nevada, a revival of interest in gold properties, the result of recent rich finds, has, it is said, set in after nearly a quarter of a century of inactivity.

The Amalgamated Republic Mines contemplate the erection of a large customs mill in Republic camp, Washington, designed to treat these ores economically by a special process. As much Canadian capital is invested in the mines of this district, this information should prove of interest to many of our readers.

The official returns of gold and silver production in the United States for the year 1906 show a gold yield valued at $94,373,800 and a production of silver of 56,517,900 fine ounces, valued at $38,256,400.

According to advices received by post at Victoria, B.C., the miners and smelter employees of the Alaska Smelting & Refining Company, at Hadley, Alaska, recently seized the company's property to enforce the payment of wages in arrears. An explanation is offered that in consequence of the decline in copper and the demands of creditors it became necessary to appoint a receiver. The liabilities of the company are $350,000. The assets include the smelter and copper mines at Ketchikan and in British Columbia.

The zinc ore production of New Jersey for 1906 amounted to 361,330 tons, constituting a record achievement in this respect.

SOUTH AFRICA.

The gold production of the Transvaal last month is estimated to have been 550,000 ounces, as compared with 538,000 ounces, the official returns for September.

Mr. J. B. Robinson, a South African magnate, recently expressed his views on the Transvaal labor question to a Reuter's representative. In this gentleman's opinion the labor supply for the mines will be ample, the Government having arranged to bring natives from Natal, while the Cape Colony is also in a position to supply labor. Mr. Robinson also stated that the mining industry had never been in such a favorable position as it is today, notwithstanding that there are now some 190 mines standing idle. Considerable discussion has, meanwhile, taken place, as to the possibility of economically increasing the number of white miners, it being proposed that one white miner at 30s. per shift be placed in charge of five or six machines, each manned by one white runner at 10s. for four holes and 2s. 6d. per extra hole. It is stated that as compared with Kaffir labor the efficiency should increase 25 to 50 per cent., and the cost per ton would then be lower.

The Transvaal Government has decided to work the new tin field in the district of Pietersburg itself, in order to give employment to white labor requiring it. The line of the tin-bearing zone extends for a considerable distance across the tops of range of granite hills called Macapaan. The metal occurs in aplite and in the coarser grained granite. Ore is at present being hand sorted and anything over 30 per cent. tinstone shipped to England.

CONGO.

An official report issued by the State comprises some interesting information on the mineral resources of this area. It is stated that in the Katanga district, at the southeastern portion of the State bordering on Rhodesia, and elsewhere, enormous belts of copper and iron have been discovered, as well as large deposits of tin. While the occurrence of gold, platinum and mercury is also reported.

NEW ZEALAND.

The report of the Department of Mines for the year 1906 places the value of New Zealand's mineral yield for that year at £3,871,811, an increase of half a million sterling compared with 1905. This satisfactory showing was chiefly due to an expansion of the gold mining industry in general and of the increased production of the Waihi gold mine in particular. Dredging operations, however, seem to have been carried on rather less extensively, and it is stated hydraulic sluicing and elevating have in many instances replaced bucket dredging. The number of dredges at work at the end of last year were 167. The average cost of dredging in the southern districts is given as about 1 3-4 d. per cubic yard, and on the west coast 2d. New Zealand's production of coal was 1,729,536 tons, chiefly bituminous or semi-bituminous in character. The number of persons employed in the industry was 12,408.

Company Notes.

The cutting of the Consolidated Mining & Smelting Company's ten per cent. dividend in half has necessitated similar action by the Canadian Gold Fields Syndicate, which owns some 4,000 shares of Consolidated, and has been paying out of its receipts from the Consolidated 7 per cent. It will hereafter pay half that in quarterly payments.

The first annual meeting of the Green-Meehan Mining Company was held on Saturday. The balance sheet showed $5,292.95 cash on hand. In reply to a question it was stated that $325,000 had been paid for the property in the first place by the present company, and of this $250,000 was cash. Instead of the 40 acre claim only 33 acres had been procured. It was decided to cancel the 1,000,000 shares of stock held in the treasury, making the new capital stock $1,500,000. The board of directors was re-elected. Manager O'Connell stated that owing to the delay in delivering machinery the development work of the mine had been greatly retarded. The present plant is valued at $21,676.15.

The balance sheet presented showed:—

ASSETS.

Cash on hand and in bank	$5,292.95
Accounts receivable	193.04
Unearned insurance	172.15
Supplies	658.67
Power plant, buildings and equipment, including buildings, equipment, power plant, tools, office furniture, etc., etc.	21,676.18
Development	6,626.94
Mine Location No. 60	1,299,955.00
Trust stock in treasury	185,000.00
	$1,519,574.93

LIABILITIES.

Accrued wages, payable November 9		$1,284.60
Capital stock originally issued	$2,500,000.00	
Less stock held for cancellation	1,000,000.00	1,500,000.00
Profit and loss account		18,290.33
		$1,519,574.93

ANNOUNCEMENT.

The Birmingham branch office of the Sullivan Machinery Company is now located at number one Twentieth street, south, instead of at number twelve, as heretofore. Additional space is thus provided for Sullivan mining and quarrying machinery carried in stock at this office.

STATISTICS AND RETURNS.

British Columia shipments, week ending October 26th:—
Boundary shipments—Week, 31,354; year, 1,049,156.
Rossland shipments—Week, 6,281; year, 234,801.
Slocan-Kootenay shipments—Week, 3,725; year, 123,240.
The total shipments from the mines in the above districts for the past week were 41,360 tons and for the year to date 1,397,197 tons.

CROWS NEST PASS COAL COMPANY.

The output of the collieries for the week endinf October 25th was 21,996 tons; daily average, 3,666 tons.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Nov. 9. Ore in lbs.	Since Jan. 1 Ore in lbs.
Buffalo	40,000	2,138,830
Coniagas	.....	4,622,820
Cobalt Central	.....	101,360
Colonial	.....	74,250
Drummond	.....	108,920
Foster	.....	513,396
Green-Meehan	.....	196,790
Hudson's Bay	.....	45,170
Imperial Cobalt	.....	37,530
Kerr Lake (Jacobs)	62,000	495,730
La Rose	456,000	2,513,970
McKinley-Darragh	.....	891,240
Nipissing	.....	4,287,301
Nova Scotia	.....	156,000
O'Brien	260,000	2,605,580
Red Rock	.....	91,443
Right of Way	.....	134,530
Silver Leaf	.....	43,518
Silver Queen	.....	837,157
Trethewey	.....	1,594,688
Temiskaming	.....	229,011
University	.....	61,383

The total shipments for the week were 954,000 pounds, or 477 tons. The total shipments since January 1, 1907, are now 22,003,406 pounds, or 11,001 tons.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending November 2nd was 21,172 tons, a daily average of 3,529 tons.

The output of the collieries of the collieries of the Crow's Nest Pass Coal Company for the week ended November 8th totalled 22,115 tons, a daily average of 3,686 tons.

COPPER EXPORTS FOR OCTOBER.

The exports of copper from the United States for the month of October were the next largest on record, amounting to 28,786 tons, the largest being in January, 1904(when they totalled 29,085 tons.

A leading copper producer figures that the total sales of copper by all companies and agencies over the last four or five weeks aggregated between 200,000,000 and 250,000,000 pounds, most of which was purchased by foreign dealers. Of the total amount the United Metals Selling Company sold between 100,000,00 and 125,000,000 pounds.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Oct. 26. Ore in lbs.	Since Jan. 1 Ore in lbs.
Buffalo	60,000	2,058,830
La Rose	309,538	1,908,100
Trethewey	64,680	1,594,688

The total shipments for the week were 434,218 pounds, or 217 tons. The total shipments since January 1, 1907, are now 20,522,093 pounds, or 10,261 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2144 tons, valued at $1,473,196; in 1906, 5129 tons, valued at $3,900,000.

DOMINION COAL OUTPUT.

The output of the Dominion Coal Company's collieries for the month of October was 3422,469 tons, or ahead of any month in the year, and only exceeded once last year, when the October output wah 350,000 tons. The showing is some 50,000 tons better than in September. Comparative figures by months:—

	1907.	1906.	1905.
January	252,248	231,606	160,612
February	226,190	225,716	128,778
March	203,194	310,220	228,765
April	316,384	296,417	221,541
May	328,947	323,777	294,647
June	319,560	325,911	332,926
July	314,559	318,291	329,164
August	316,633	327,734	329,172
September	295,058	323,733	322,288
October	342,469	350,000	333,317
November	.....	308,367	303,440
December	.....	206,884	211,877
Totals	.....	3,248,565	3,196,527

Philadelphia.—The anthracite production in October was 6,015,551 tons, as compared with 5,384,768 tons in October last year, an increase of 530,783 tons. This is the largest month's production.

Nelson, B.C.—Following are the ore shipments and smelter receipts in Southeastern British Columbia for the week ending November 2nd and year to date in tons:—

Ore shipments—	Week.	Year.
Boundary	39,701	1,079,857
Rossland	6,197	230,998
East of Columbia	3,699	131,689
Totals	40,497	1,442,544
Smelter receipts—	Week.	Year.
Grand Forks	20,739	595,147
Greenwood	7,150	290,158
Boundary Falls	.....	158,394
Trail	7,955	213,588
Nelson	.....	11,340
Northport	2,204	82,605
Marysville	600	26,400
Totals	28,648	1,377,622

RAND GOLD OUTPUT.

Gold production of the Transvaal last month, as estimated by Kaffir houses in London, was 550,000 ounces, fine, against 538,000 officially announced for September. Value of the October output, calculated on the basis of the above estimate, compares as follows: October, 1907, $11,687,000; October, 1906, $11,422,000.

COPPER STATISTICS.

Copper exports from the United States for ten months this year according to Government returns, have been 156,689 gross tons, equivalent to 351,000,000 pounds, approximately. Total consumption in the United States for ten months is estimated at 440,000,000 pounds, making a total consumption of 791,000,000 pounds. Total production for the month is figured at about 682,000,000 pounds.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Nov. 2.	Since Jan. 1
	Ore in lbs.	Ore in lbs.
Buffalo	40,00	2,098,830
Foster	66,000	513,306
La Rose	249,870	2,157,970
McKinley-Darragh	120,000	891,240

The total shipments for the week were 475,870 pounds, or 237 tons. The total shipments since January 1, 1907, are now 21,049,406 pounds, or 10.524 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2144 tons, valued at $1,473,196; in 1906, 5129 tons, valued at $3,900,000.

COBALT'S OCTOBER OUTPUT.

The shipments from Cobalt camp for the month of October have been almost a record.

For September last the output from the camp was 760.5 tons, while for the month of October it was 1,174.56 tons, or an increase of 414.06 tons. The shipments for the month were as follows:—

	Tons.
La Rose	432.51
McKinley-Darragh	351.62
Buffalo	120.00
Trethewey	91.83
Coniagas	32.50
Drummond	32.31
O'Brien	32.30
Nipissing	30.50
Kerr Lake	29.99
Townsite	21.00

The total output from Cobalt camp for the first ten months of this year is 10,924.65 tons, or a monthly average of 1,092.46 tons.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.

Antimony—9 1-4 to 11 1-2 cents per lb.

Arsenic, white—6 7-8 to 7 1-4 cents per lb.

Barytes, crude—$18 to $20 per short ton.

Bismuth, metal—$1.75 per lb.

Cadmium, metal—$1.50 per lb.

Carbons for drills—$70 to $90 per carat.

Carborundum, powdered—8 cents per lb.

Chromium, metal pure—50 cents per lb.

Cobalt, f.o.b., Cobalt, Ont., unrefined—30 to 40 cents per lb.

Corundum—7 1-2 to 10 cents per lb.

Feldspar, ground—$10 per short ton.

Flourspar, lump—$8 to $13 per long ton.

Graphite, domestic—$50 to $150 per ton.

Gypmsum, lump—$7 per short ton.

Infusorial earth, ground—$15 to $30 per ton.

Manganese, pure metal—75 cents per lb.

Mica, ground—$45 to $75 per short ton.

Mica, scrap—$10 to $15 per short ton.

Molybdenum, pure—$1.70 per lb.

Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.

Nickel, metal—45 cents per lb.

Platinum, ordinary metal—$26.50 per ounce.

Platinum, scrap—$19 per ounce.

Pyrite—10 to 11 3-4 cents per unit for 38 to 45 per cent. sulphur, lump ore or fines.

Quicksilver—$45 per 75 lb. flask.

Sulphur—$10 to $21 per long ton.

Talc—$15 to $30 per short ton.

Tungsten, pure metal—$1.30 per lb.

Tungsten, ore, 60 per cent. pure—$9.50 per unit.

MARKET NOTES.

Silver.—October 17th, 60 7-8 cents; October 18th, 60 cents; October 19th, 60 cents; October 21st, 61 1-8 cents; October 22nd, 61 1-2 cents; October 23rd, 61 5-8 cents; October 14th, 61 3-8 cents; October 25th, 61 cents; October 26th, 60 1-4 cents; October 28th, 60 1-2 cents; October 29th, 59 1-8 cents; October 30th, 59 1-8 cents; October 31st, 59 3-8 cents; November 1st, 59 1-4 cents; November 2nd, 59 7-8 cents; November 4th, 60 1-8 cents; November 6th, 60 5-8 cents.

Mexican dollars, 47 3-4 cents.

Sterling exchange, $4.8575.

Copper.—Since October 17th lake copper has fluctuated between 11 3-4 cents on October 23rd and 15 cents on November 6th. More business is doing, but the market is still very quiet. New York, lake, 14 3-4 cents; electrolytic, 14 cents. London, £63 12s. 6d. for spot.

Spelter.—Market quiet. New York, 5.10 to 5.15 cents; London, £21 15s.

Lead.—Lead is steady at 4.75 cents, New York; London, £18 for Spanish.

Tin.—New York, 30 1-2 cents per lb.; London, £138 10s. for spot. Market weak.

Pig Iron.—No. 2 foundry quotes at $21, Pittsburg. Basic iron, $19.

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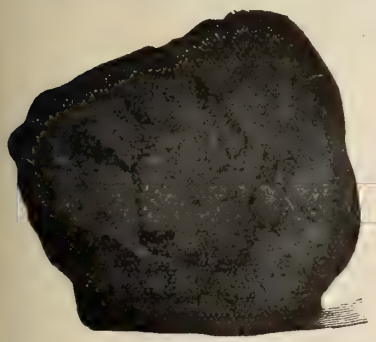
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The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such license the first right to purchase the mines. In the case of lands where the surface only is sold, the owner of the surface may be expropriated if he refuses an amicable settlement

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

On lands situate more than 20 miles from a railway in operation, $10.00 per acre, and on lands situate less than 20 miles from such a railway, $20.00 per acre:

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Patents are obtained subject to the following conditions: The full price must be paid in cash; specimens must be produced and accompanied by an affidavit; a survey at the cost of the applicant must be made on unsurveyed lands; work must be bona fide begun within two years and $500.00 spent for each 100 acre concession.

MINING LICENSES, giving the right to work the mine and dispose of its products, are granted on payment of a fee of $10.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres or one and the same person, and must be marked out on the ground by posts

The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the Government

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the new Transcontinental Railway will run,

The government has made special arrangements with MR. MILTON L. HERSEY, 171 St. James St Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines, at Quebec, will give all the information asked for in connection with the mines of the province, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to:

The Hon. Minister of Colonization, Mines and Fisheries,
Parliament Buildings, Quebec.

The Canadian Miner's Buying Directory.

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Dominion of Canada

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QUARTZ—A person 18 years of age, or over, having discovered mineral in place, may locate a claim 1,500 x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 per acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square; entry fee $5, renewable yearly.

An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

W. W. CORY,

Deputy of the Minister of the Interior

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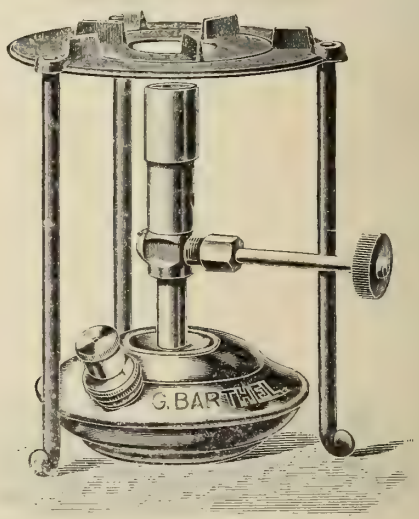
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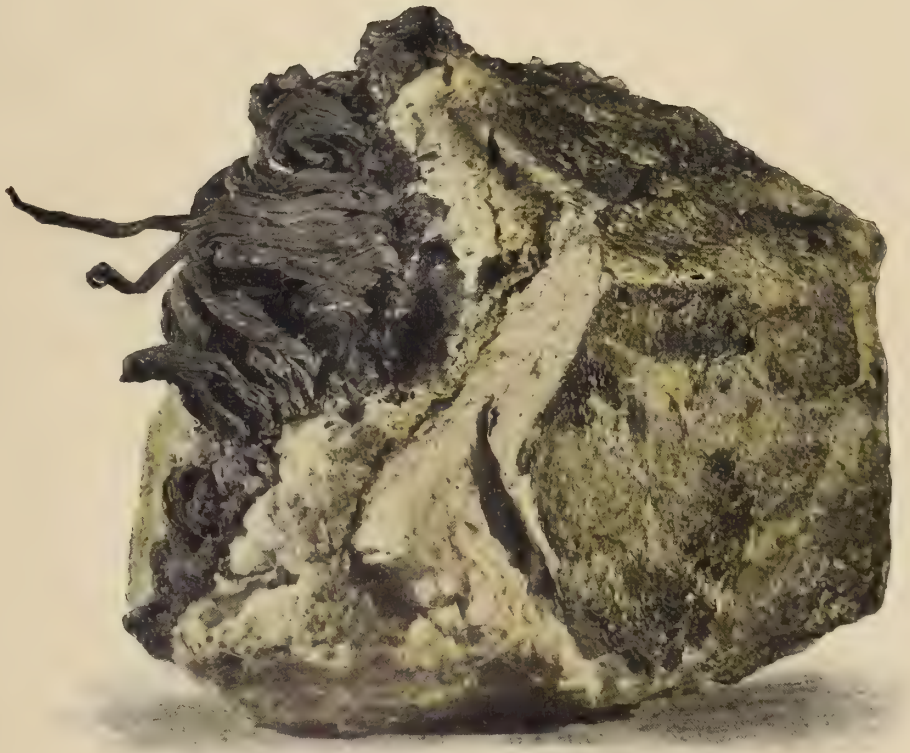
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Argentite from Kerr Lake Mine, Cobalt, Ont.

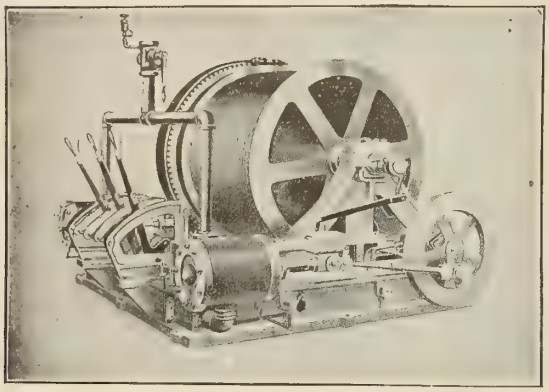
Pages of Special Interest

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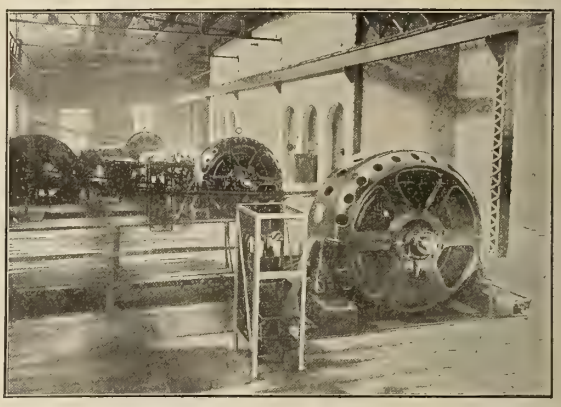
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PROFESSIONAL CARDS - XIX, XX XXI and XXII
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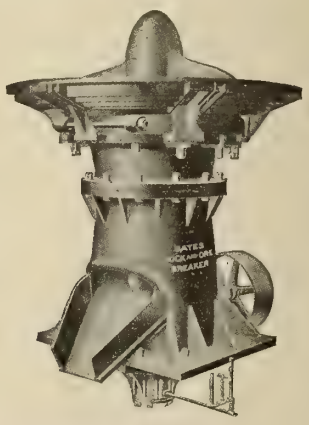
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The Tonnage of Ore mined in 1906 was 1,963,872 tons The Gold Production in 1906 was $5,579,039 the Lead Output 52, 408,217 lb., and the Copper 42,990,488 lb.

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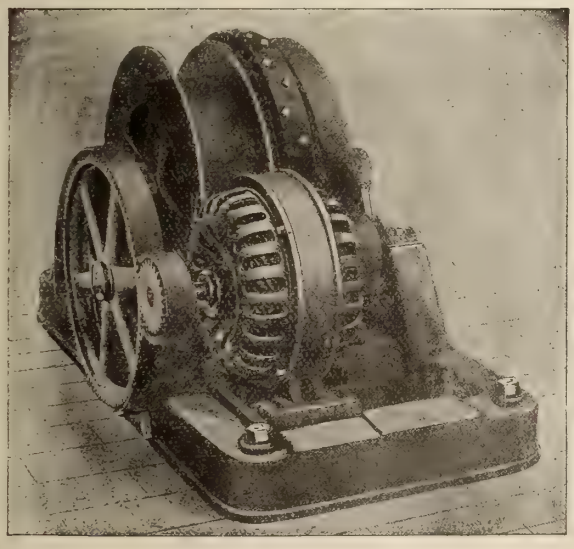
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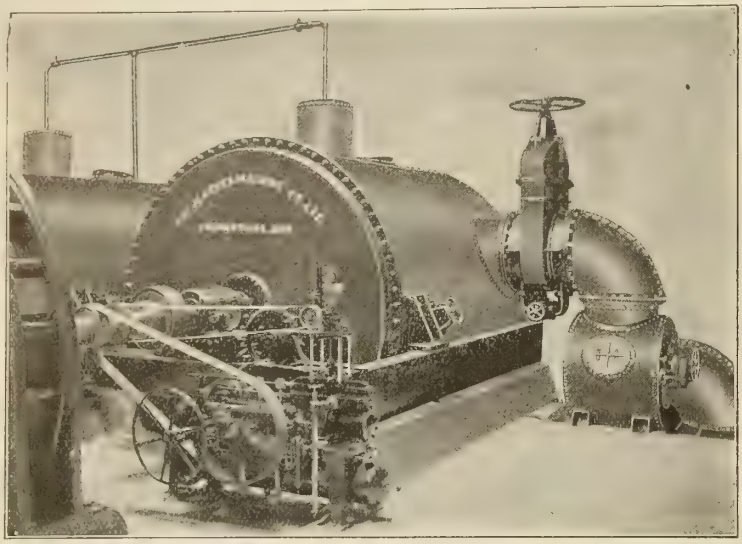
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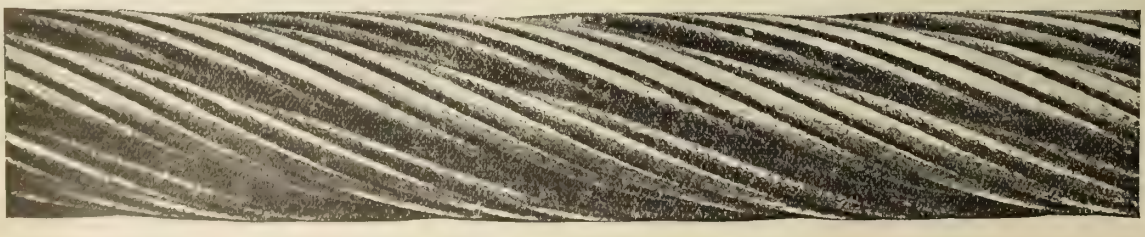


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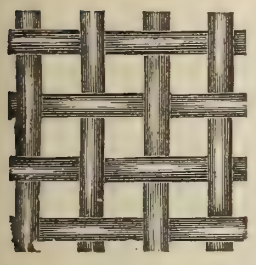
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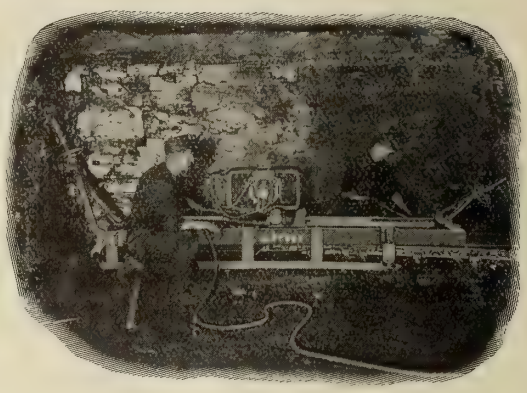
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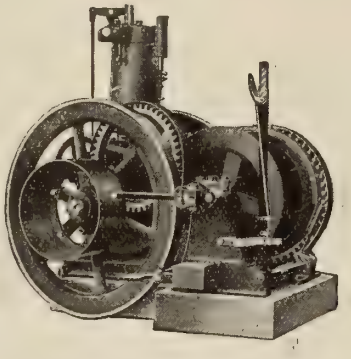
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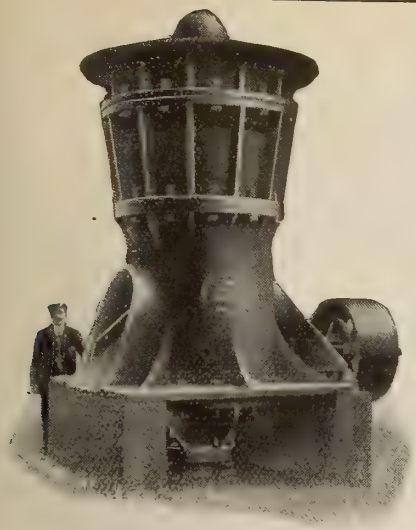
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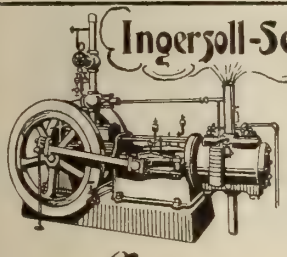
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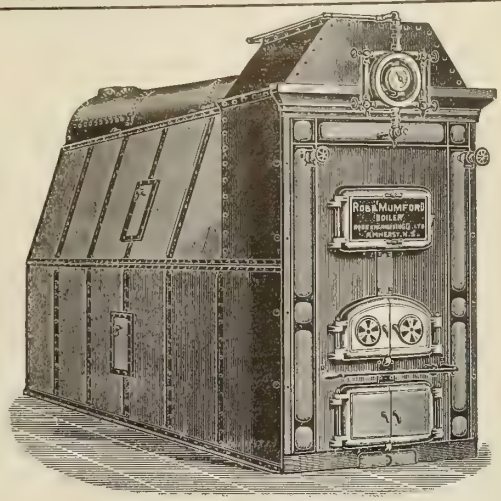
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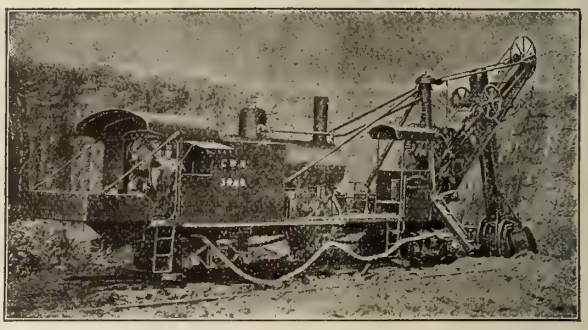
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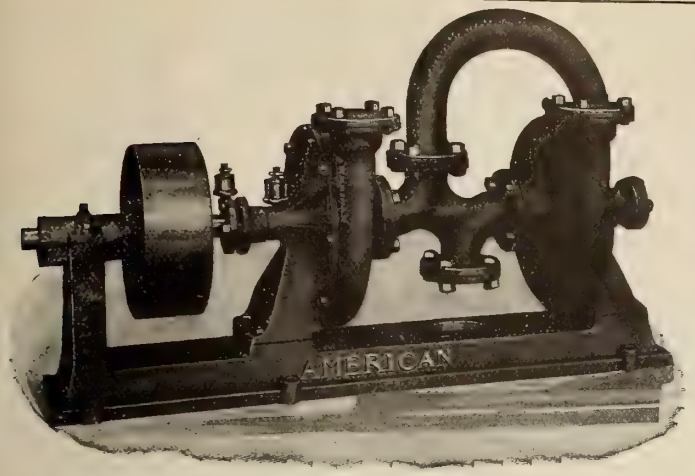
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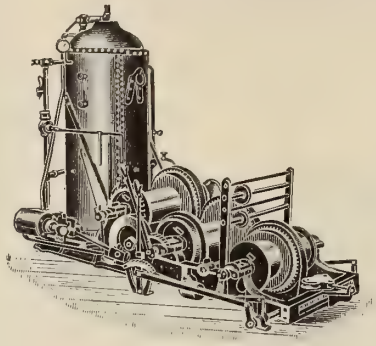
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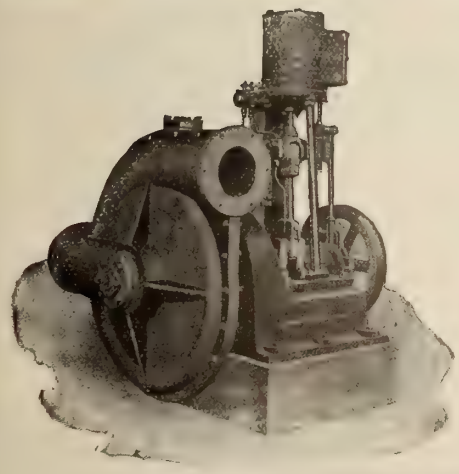
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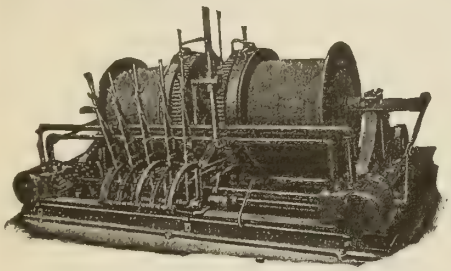
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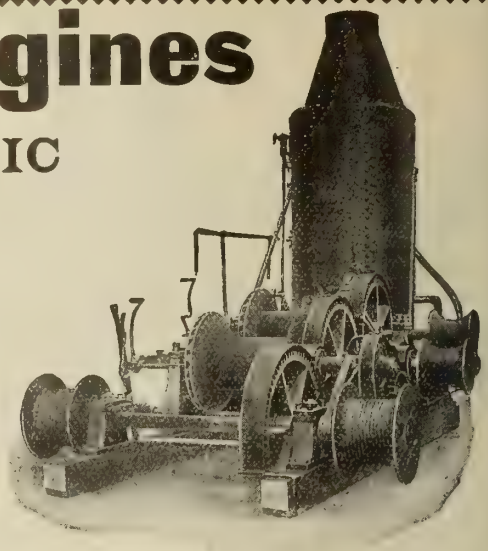
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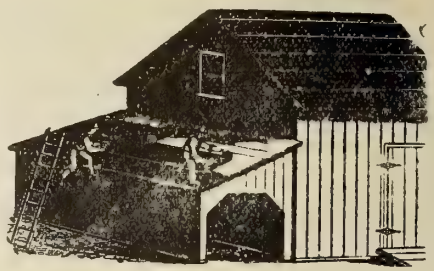
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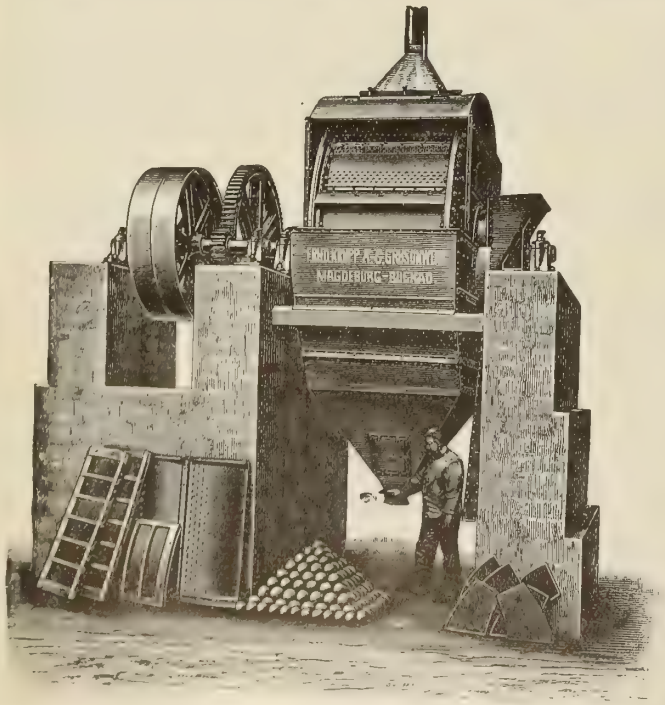
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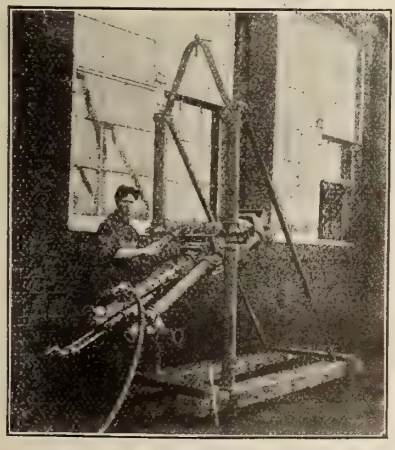
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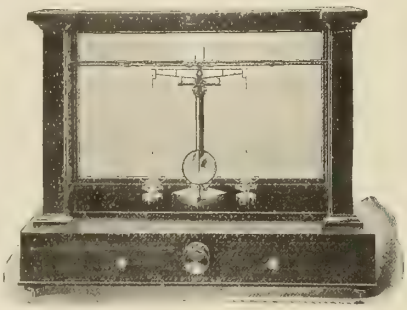
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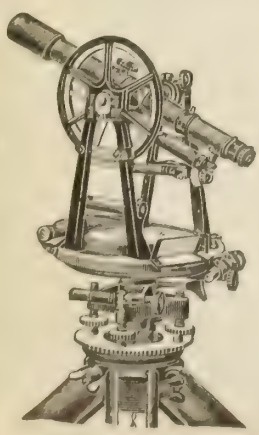
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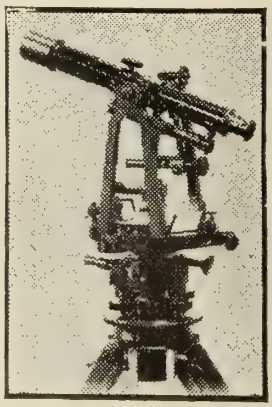
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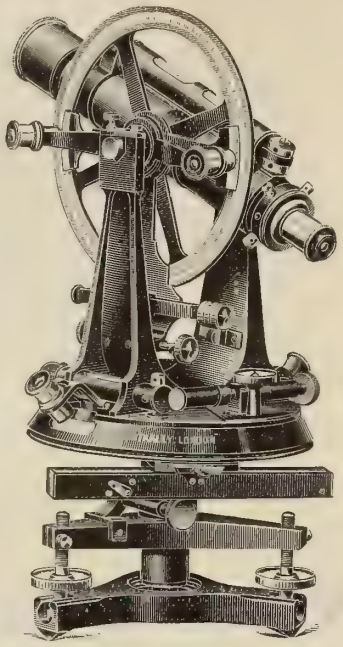
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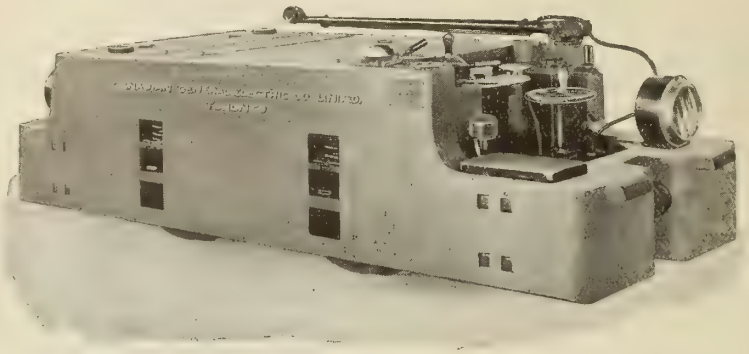
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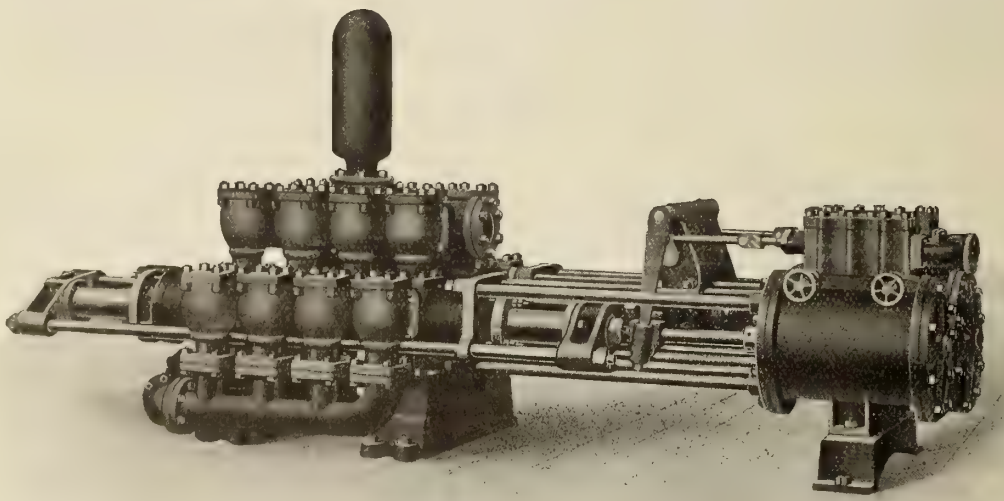
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THE OFFICIAL ORGAN OF THE CANADIAN MINING INSTITUTE

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SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

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THE BEGINNING OF THE END.

A HISTORY AND A MORAL.

When the CANADIAN MINING JOURNAL began its its open attack upon fradulent promotions, a speedy victory was not expected. But, owing to the prompt and most creditable action of the Ontario Government, the situation has been cleared and a precedent of extraordinary significance has been established.

It was recognized from the first by those chiefly concerned in conducting the anti-wild-cat campaign, that the offending companies were organized for the especial purpose of evading the letter of the law.

Also it was recognized that human ingenuity could not construct a law that dishonest persons could not evade. It was then concluded that since the Ontario Companies Act is as clearly expressed and carefully constructed as can well be expected, and since this Act was being both evaded and disregarded, therefore it was necessary to see that not the letter alone, but the spirit of this Act be respected and observed.

The firm of Law & Company was chosen as the first point of attack for two reasons—it had erected already one monument of falsehood, "Silver Bird"; and its advertisements were fast becoming a public nuisance.

For several reasons it was thought wise to begin proceedings by laying information against Law & Company for breach of the provisions of the Companies Act. A criminal action for fraud could even then have been instituted. This, however, would have entailed delay and trouble and would not have served our purpose so directly.

The Provincial Secretary's Department at once acted upon the information laid and commenced proceedings against Frank Law. Law's associates, Russell and Abendroth were served with subpoenas. Russell promptly left for England.

After frequent hearings in the Police Court, during which most damaging evidence, bearing on Law & Company's methods, was heard, the Government decided to institute criminal proceedings. Accordingly on Monday afternoon, November 18, Frank Law was placed under arrest. The arrest was made in the Police Court just as an adjourned session of the trial under the Companies Act was beginning.

All relevant papers, and documents were immediately removed from Law's office. Law himself was given freedom on ten thousand dollars bail, exclusive of his personal securities. Meanwhile Russell, who is included in the indictment, is supposed to be on his way back from England.

Up to the date of writing Magistrate Kingsford has not given a decision on the Companies Act case.

A few days after the Companies Act case was begun, Law & Company started proceedings against the CANADIAN MINING JOURNAL for libel and prayed for an injunction against us. The injunction was refused by Chief Justice Meredith. Whether the suit against the JOURNAL is or is not proceeded with is immaterial. The present result amply justifies our position.

The principals of Law & Company now stand charged with fraud in connection with the flotation of Silver Bird, Blue Bell, Lucky Boys and Highland Mary. The Crown Attorney possesses all essential documents.

For the benefit of the public we give the following facts: Frank Law, the head of the firm of Law & Company, was, about four years ago, a barber in Montreal. Graduating from life insurance he started his present business in Toronto not more than a year ago.

With these qualifications for guiding the public in mining instruments he, or his firm, has abstracted a goodly number of dollars from innocent victims.

The above is a mere skeleton of the history of our efforts to bring Law & Company to justice. In themselves Law & Company need not be mentioned again. We shall be glad to drop the unclean subject.

But the episode has brought into light some important truths.

Foremost of these is this—the Ontario Companies Act is a comprehensive and sufficient piece of legislation. Second and, of as great importance, is the consideration that the Ontario Government can and will administer that Act as it should be administered. Of even greater future significance is the fact that the Government, in taking criminal action against Frank Law, shows that it is determined to stamp out improper mining flotations.

Ontario is no longer a breeding place for wild-cats. The Provincial Government has created a precedent that will swiftly and surely kill the entire breed. It is true that the Government did no more than its duty; but it is not every Government that will cheerfully accept its moral responsibilities.

Ever since the first days of Cobalt's boom the mining fakir has waxed fat. The Canadian public has swallowed tales of treasure-trove, compared with which the Arabian Nights are anemic and Captain Kidd's history but a pale anagraph. The bait has been taken. Latterly the barb has made itself felt. We hope, we believe, that the lesson has been taken to heart, for a time at least.

And now for the inevitable moral. If Canadians, with money to invest in mines or prospects, wish to go about it in a sane, profitable way, there is but one course. In Canada there are now a large number of especially trained, honest and capable mining engineers. McGill, Queens and Toronto are graduating some dozens every year. These men have made it their business, their life work, to learn about Canadian minerals, how they are found, how they are won and how they are made into commercial products.

The services of these men are procurable. As mining engineers they practice a profession at once honorable and arduous; a profession demanding broad mental development and more than average physical stamina. They have spent years of preparation. They must, from the nature of their work, undergo hardships that no other professional men are called upon to endure.

The title of mining engineer, properly won and properly worn, implies high technical skill added to scrupulous honesty.

These then are the men, products of our own universities, or of universities of equal standing, by whom the Canadian public should hereafter be guided in mining affairs.

One word on a delicate subject is necessary before concluding. There is a vague, though general, impression current that when a mining engineer asks a substantial fee for making an examination of a mining property, he is setting an exorbitant price upon his services. A little thought will correct this error.

The independent mining engineer is the product of an expensive education and of a more expensive practical training. Work with him is not usually continuous. There are long idle periods to be reckoned upon. This is one controlling factor.

Another is that the examination of a mine, or even a prospect, is almost always an expensive thing in itself. More especially is this the case in Canada. The taking of samples, the making of plans; the collecting and coordinating of data geological, mineralogical and metallurgical; the investigation of conditions of labor, market, transportation, fuel supply, water supply, are responsible and laborious work. A favorable report from a good engineer transforms commercially worthless ground into a negotiable asset. This must be kept in mind by the owners of mineral lands. The advice of a mining engineer at the right time may save much useless expenditure; also, the imprimatur of his approval may multiply the value of a claim many times.

As a corollary to its wild cat campaign THE CANADIAN MINING JOURNAL intends to begin at once a series of sketches of the leading mining engineers practising in Canada. Whenever possible portraits will accompany these articles. Neither sequence of seniority nor alphabetical order can be followed. But we hope to cover the whole field.

We have chosen this course deliberately as a constructive antidote to the mining fever and as the best preventive of a recurrence of a wild cat plague.

That Cobalt has lived through over-capitalization and manipulation is evidence of the camp's solid worth. The total output of 1907 will be gratifyingly larger than that of previous years. The present depression is forcing upon managers and directors the necessity of curtailing expenses. The attitude of the American smelters compels shippers to look around for other markets and to

begin the erection of Canadian smelters. These conditions will help to bring about important changes in Cobalt itself. That the camp is a rich one is unquestionable. But not until recently has it been so obviously necessary to adopt economical methods. Thus the depression of stocks and the scarcity of money will undoubtedly prove blessings. Cobalt put upon her mettle will do better than Cobalt hysterical.

It is not improbable that our attacks upon dishonest financial methods may, indirectly, do harm to Cobalt in general. We therefore wish to indicate plainly that of Cobalt's present worth and future success we entertain only the most favorable opinion.

A NIGHTMARE.

The *Mining and Scientific Press* of San Francisco in its issue of November 16th, prints a letter entitled "The Wild Cats of Ontario." It is dated from New York and is signed "D.A."

The letter suggests that THE CANADIAN MINING JOURNAL should expose what "D. A." is pleased to call "the Ontario conspiracy." "This," the writer explains, "is a gigantic conspiracy among the people of Northern Ontario to spread, and pretend to believe, the false reports emanating from irresponsible prospectors and fortune hunters."

The writer continues in this strain. Like Tomlinson, he repeats several things that he has been told, all of them extremely damaging to Cobalt and Ontario.

The specific statements concerning the Silver Queen, O'Brien, McKinley-Darragh and La Rose are untrue. They are based upon the cheap stories that cheaper male gossips circulate in every mining camp. Mostly these stories are created and repeated to give a fictitious importance to the teller. Neither "D. A." nor any other foolish person of his kind is in a position to know the facts about the mines mentioned.

If the "gigantic Ontario conspiracy" needs refutation at all it can be met by the one fact that THE CANADIAN MINING JOURNAL has received hundreds of letters from the engineers, miners, prospectors and mine owners of Northern Ontario, offering all assistance in the work of extirpating frauds and fakirs.

We doubt, however, if any person who has visited Northern Ontario could be induced to take "D. A." seriously.

It is the fear that this totally unwarranted letter may damage Cobalt in the minds of American readers that leads us to notice it.

There is no need of descending to the methods of wild cats in dealing with them. But "D. A." is quite as untruthful as the worst of these felines.

Repeating what we have said on another page, a sufficient answer to all such calumy has been made by the Ontario Government. The Government has set its face definitely and resolutely against mining frauds. In this it has also set an example that "D. A.'s" own country could not do better than follow.

THE CONSOLIDATED MINING AND SMELTING COMPANY.

The payment of a November dividend by the Consolidated is a pleasant offset to other and discouraging reports from British Columbia. The company has an issued share capital of $5,355,200, divided into 53,552 shares of $100 each. This last quarterly dividend amounted to $133,880. This is the seventh dividend disbursement at the rate of ten per cent. per annum.

The Consolidated is an example of the benefits of selective amalgamation. Under its control are the War Eagle and Centre Star groups of mines in the Rossland district; the Eureka group at Sandon; the St. Eugene at Moyie; and the Snowshoe group at Phoenix. The Trail smelter is also the company's property.

There are undeniable advantages in consolidation. The fortunes of a company, whose interests are not confined to one district are less susceptible to ordinary vicissitudes. The failure of one mine does not necessarily imperil their whole enterprise.

On the other hand, there is a needless duplication of work in mining districts where many mines are operated by single individuals or companies. In Germany this has been recognized. By a loose, but efficient, association of interests the owners of coal and iron mines, the blast furnace companies and the steel corporations work together. Orders for iron and steel are distributed and allocated by the central offices of syndicates. All matters pertaining to transportation are dealt with by specially trained experts. In fact the individual producers of ore, coke, pig iron or steel are relieved of much of the incidental troubles that so militate against similar operators in Canada. The German producer is assured of his raw material at a fixed rate and of a sale for his product.

To a certain extent like benefits accrue to the members of any well organized consolidation.

This is not a panegyric on trusts. It is merely an amplification of the old saw, that in union there is strength.

NOVA SCOTIA AND THE JAMESTOWN EXPOSITION.

Nova Scotia's exhibit of gold ores has won highest distinction at Jamestown. This is gratifying. Upper Canadians are ignorant to an amazing degree of the mineral wealth of Nova Scotia. In Boston and New York her resources are better known. But throughout both Canada and the United States Nova Scotia needs advertising.

We are informed that the creditable exhibition made at Jamestown was organized largely by a Virginian lady, who is interested in a Nova Scotian mine. Part

of the exhibit is the personal property of Mr. A. A. Hayward, past president of the Nova Scotia Mining Society, and late manager of the famous Golden Lode mine.

It is but a matter of time when Nova Scotia's gold fields will come to their own. They have passed through two stages—one of early crude methods and one of mismanagement. With improved methods and a better understanding of the geological phenomena, Nova Scotia will presently lead all Canada as a gold producer.

A GOOD MOVE.

The Ontario Bureau of Mines has engaged Mr. G. C. MacKenzie to look into the adaptability of various methods of magnetic concentration to the iron ore deposits of the Province. Mr. MacKenzie's instructions are, as they should be, general. Electric smelting, magnetic cobbing, magnetic concentration and kindred processes will be investigated. Then will follow a thorough examination of the extent, nature and availability of many iron ore deposits hitherto considered unworkable.

The Bureau of Mines is acting with wise prevision in this. The advance of science is rendering valuable ore bodies that ten years ago were worth nothing. Undoubtedly also electric smelting is the process of the near future, especially in a country where water power is cheap and abundant.

The choice of Mr. MacKenzie is a good one. Mr. MacKenzie is a graduate of Kingston School of Mining. Though a young man, he has had wide experience in mining. He is a proficient iron metallurgist. Thus he is well fitted to conduct this very important investigation.

The results of an enquiry so complicated and of such immediate significance will be looked for with eagerness, not only in Ontario but throughout the whole of Canada.

The investigation, we take it, will not be confined to the commercial aspects of the question, but will in addition deal with the present condition and future promise of electro-metallurgic processes of reduction and, more especially, with the comparative merits of magnetic concentration methods. On these subjects there is a large and constantly increasing series of monographs. This literature constitutes a valuable starting point for the investigator. Indeed a careful summary of literature already published would form an excellent introduction to the final report.

THANKS.

The *Mining Reporter,* November 14th, makes appreciative mention of The Canadian Mining Journal's attitude towards questionable mining schemes. We are grateful for this. Coming from such a source, appreciation is significant. The *Mining Reporter* is one of a number of American periodicals whose whole influence is for good. The United States is by no means free from fraudulent mining promotions. But the educative and moral power of clean technical journals has done very much to restrict wild cats. Indirectly, by the dissemination of knowledge; directly, by exposing fraud, the technical press has performed a high mission.

A THREE CORNERED ROW.

Three of our contemporaries on the other side of the line have been indulging in a little squabble as to the errancy of copper statistics. Witnessing the fray from afar, we would award the victory to the *Mining and Scientific Press.* Our Chicago contemporary, the *Mining World,* lays claim to inerrancy and infallibility. These claims the *Press* punctures with all the surgeon's pleasure in a perfect incision.

Only two disputants were involved at first—the *Engineering and Mining Journal* of New York and the *Mining and Scientific Press* of San Francisco. The *World* "butted in" (that phrase is used advisedly) with results disastrous to itself. The *Press* has a long, sharp sting. It used that sting on the *World.* Our metaphors may be mixed; but we await eventualities with fervent interest.

NOMINATIONS.

At a well attended meeting of the Toronto Branch Dr. W. G. Miller was nominated for the presidency of the Canadian Mining Institute. A similar nomination, signed by a large number of members, was also sent to headquarters in Montreal from Cobalt. The Toronto Branch has also nominated Dr. A. E. Barlow for the position of vice-president, and Mr. J. B. Tyrrell for councillor. It would be hard to select three more fitting men.

Editorial Note.

A government laboratory is an asset of tremendous value. The Quebec Government, although it possesses no laboratory of its own, has had an arrangement with Mr. Milton Hersey, of Montreal, whereby prospectors and others can have all varieties of mineral samples assayed and analyzed at very moderate rates. Qualitative examinations are made for the nominal fee of twenty-five cents. Incidentally it may be remarked that the qualitative examination is far more useful than is usually recognized. An assay or a quantitative estimation is often misleading for the reason that the original samples are not representative. A laboratory, conducted by a chemist whose reputation is established beyond question, no doubt appeals to the public more than an enterprise controlled by the Government.

THE CARIBOO-McKINNEY MINE.

The old Carriboo-McKinney mine, at Camp McKinney, B.C., about twenty-seven miles west of the Granby mines at Phoenix, is once again being operated, after having been closed down for several years. A syndicate of Phoenix people, yclept the Cariboo-McKinney lessees, about a year ago leased and commenced work upon the property. Following is a list of the officers of the Cariboo-McKinney lessees syndicate: President, R. B. Boucher; secretary, Geo. L. McNicol; superintendent, P. D. Ahier; directors, L. Y. Birnie, C. M. Campbell, William Rowe, W. S. Macy and A. B. Hood. The head office of the concern is situated at Phoenix, B.C.

Owing to the impaired condition of the shaft, it having been found, in the lower levels, to be full of timbers and rock intermixed, it took over six months to get the water out of the mine to the four hundred foot level. Prospecting for ore was then undertaken and after some little work what appeared to be a good body of ore was located on the two hundred foot level. Ten stamps of depth than they have now attained. It consists of sixty and eighty horse-power boilers, hoisting engine, five drills, compressor, pumps, etc. Only two air drills are being operated at the present time on the development work, and as has been stated before, the outlook is not very encouraging. However, the Phoenicians are born optimists anyway, and the lessees hope for brighter things later on.

The six claims which comprise the property of the Cariboo-McKinney are the Cariboo, Amelia, Okanagan, Saw Tooth, Maple Leaf and Emma. Supplies for use at the mine are shipped to Bridesville on the Great Northern Railway, and go from there to Camp McKinney, ten miles, by a good wagon road.

The authorized capital of the Cariboo-McKinney Company is $1,250,000, par value of shares $1 each. The company has paid $546,837 in dividends to date, the last dividend having been paid the shareholders in February, 1904, which only amounted to four cents per share. The



CARIBOO-McKINNEY SHAFT HOUSE AND COMPRESSOR ROOM.

the battery of twenty now on the property were fixed up and two hundred tons of this ore was put through the mill, but when the clean-up was made and a gold brick turned out it was found that the values saved from the ore taken from the two hundred foot level were not sufficient to mine and mill it and pay a profit, so the lessees have closed down the mill and at the present time are prospecting for a better grade of ore. I am informed from a reliable source that up to the time of this writing there is no ore in sight that is worth taking out of the mine. Some of the ore which they have encountered runs from $3 to $12 per ton, and there are pay streaks in this running from $12 to $31 per ton. Of course prospecting a mine like the Cariboo is somewhat of a gamble, and at any moment the miners are apt to encounter exceedingly rich ore, a very small body of which would put a lot of money into the pockets of the lessees.

There are now only about twelve men working in and around the mine. The property is equipped with a mining plant of sufficient capacity to mine to a greater

shares, which sold considerably above par eight or ten years ago, and around 36 cents per share five years ago, can now be secured for about four cents per share.

Al. McKinney, now nearly broke and dying of cancer on a small farm in Washington State, with some other prospectors, leaving Colville, Wash., in the spring of 1887 and going up into the Creek district, passed through the placer workings that were then being operated there and going along the ridge dividing the North and South Forks of Rock Creek came to the bare spot where now lies the Cariboo. Here they found decomposed quartz with the free gold plainly visible in it. The Cariboo claim was staked on the discovery, but the discoverers made a mistake in supposing that the vein ran north and south and staked the claim in that direction, the claim being 1,500 feet by 600 feet, as required by the laws in force at that time. McKinney and another prospector each owned a moiety in the Cariboo, and one of their partners, "crying" because he was not in on the deal, was appeased by McKinney showing him what appeared

to them a parallel vein to the east of the Cariboo. But this other man was from Patagonia, and McKinney had to take a pan of the decomposed rock to the creek and pan out the gold before he would believe. The pan of dirt ran $2.50, and so the Amelia was located at the same time, "doubting Thomas" and the other prospector getting in on the ground floor.

In 1887 McKinney sold his interest in the Cariboo to a Spokane syndicate, among whom were James Monaghan, Geo. B. McAuley and Clement King, for about $7,000. However, the Spokane people were not in a much better position to operate the property than McKinney and his partners, so it still lay idle. Finally in 1894 Monaghan secured a second-hand milling plant on a long credit, and, arranging with his miners that they should depend on the proceeds of the mine for part of their wages, he started to work. The Cariboo paid handsomely from the moment the first stamp dropped, which was on April 24th, 1894.

Several years afterwards Monaghan sold most of his stock for sixty cents per share, and the money from the sale of these shares, together with what he had received in profits from the mine, amounted to nearly $400,000.

From 1894 to the time when it closed down a few years ago, the Cariboo mine produced something over two million dollars altogether.

McKinney and the money he got for his interest in the Cariboo were eventually parted, and once again he turned towards the rugged hills, his heart filled with the sempiternal hope of the prospector, searching for another of nature's treasure deposits, but he has never since made a find to compare with the Cariboo. Recently when in the Hope Mountains, on what McKinney knew to be his last prospecting trip, when he was making a final effort to leave his daughter a competence, he fell exhausted and would have died a lonely death in the hills he loved had he not been found and brought back to where he could receive the attention he required. Such is fate!

GEO. A. OHREN.

Oct. 25th, 1907.

DIAMONDS IN ARKANSAS.

The yellowest daily journals of New York City are devoting considerable space and corresponding display to the authenticated discovery of diamonds in the State of Arkansas—a not unexpected event—though attended by the usual degree of unveracity, taking this for example:—

"Arkansas Farmers
"Desert the Plow
"For the Diamond."

"Harvest Fields Being Run by Women While Men Seach for Fortunes."

Cotton crops are spoiling, farmers are "diamond crazy." Labor is "impossible to get," male members of families "are out combing the banks of the Little Missouri in search of wealth." Such is the introduction followed in sequential order by assurances that

"There are real diamonds in Pike County and plenty of them."

"Two and a half miles south of Murfreesboro there is the crater of an extinct volcano in which occurs periodrite (a printer's error), the South African diamond-bearing rock, and up to date more than one hundred and forty stones, running in size from one to six and one-half carats have been found."

That such stones "are of the finest quality and lustre," also goes without saying, notwithstanding the writer said it. The further averment that "the crater is at least one mile in diameter" and that "ten shafts sunk within this radius have tapped the diamond-bearing rock" arouse the suspicion that "the Arkansas Traveller" is again active in amusing fictions.

It is quite possible that "a number of prospectors are working the shoals along the river bed and are getting good returns." No one will have to dispute the statement that "a few good diamonds have been found along the river bank, having undoubtedly been washed from the volcano." That is, this mile wide mine, during the period of activity as a volcano, when the point of least resistance expanded and muds and associated minerals were rushed into the vacuum, was subjected to a species of sluicing, causing "the volcano" to disseminate gems along the "shoals" and "banks." The lay writer on the subject probably mistakes the period of deposition—a minor detail, perhaps. He might be excused had he not continued thus:—

"According to the geologists sent here by the Government to investigate the diamond field, at some remote period the Gulf of Mexico extended as far north as the volcano in which the diamonds are found. During an eruption, they say, under the water, the sudden cooling of the earth, together with the great pressure, formed the diamonds. The stones are found in quantity about twenty feet below the surface and under a bed of gravel. No drill has yet been sunk deep enough to find out the depth of the peridotite."

Needless to say, the origin of these diamonds, as recounted, will astonish "the geologists" referred to, Professors Crookes and Myers, Mr. Kunz, international crystallographers, and the directorates of Kimberley and Transvaal mines. A globular crater "a mile in diameter"—seven or eight times larger than any "pipe" of payable value—and that before the characteristic containing walls of "the volcano" are defined—"licks creation." Nothing of the sort was heretofore classified among the "great expectations" of mining men. The Arkansas writer may have divined this claim area, or it may only be a measured aberration on his part. While he was at it, however, he might as well have anticipated the future ascent, and the records of the diamond drill core, which drill is to be "sunk deep enough to find out the depth of the peridotite." Having presumed as to the diameter of the circuitous crater he could have projected his hypotheses to vertical details, thereby leaving it to "rotaries" and "pulsators" to present the diamonds as their portion of the daily routine of such mining.

Because Ontario has an assortment of "experts" who bring discredit upon honorable and distinguished technical men earnestly engaged in conscientiously determining the economic worth of its mineral resources, the

advent of this Arkansas writer points a moral. He glibly refers to "diamond-bearing rock," describes the volcano forming and emitting gems like clay pigeons from a trap, obviously escaping from subterranean cold and crushing forces; yet he intimates that the depth of the peridotite is a matter of solicitude.

Ontario has evolved "gems" in the form of prospectuses. This Arkansas "expert," and whoever inspired him, will be readily conceded precedence in this regard, because a new theory and practice relating to diamonds and diamond mining are comprehensively expounded. Unfortunately, such "experts" cause "farmers" to "desert the plow"—or sell it—drive women to despair, or the furrow—and indirectly discredit scientists devoted to the determination of mining problems. For years it has been an open secret that diamond-bearing craters or "pipes" might at any moment be found on this long line of fissuring. The trouble there has been, as elsewhere, unscrupulous and improvident speculators conceived it to be a first principle, that millions worth of scrip must be issued and parcelled out among the adventurous public before a washing test was made of the diamondiferous ground. In one glaring intsance a company, capitalized at $5,000,000, with every mineral present that the Kimberley mines disclose—except diamonds—had not washed a solitary load to ascertain whether the one indispensable existed in "the pipe." Scrip at 10 cents on the dollar was put in circulation.

This Arkansas development is in danger of being involved in similar scandals, and rather than submit to such "experts," it devolves upon those responsible for cotton crops rotting in the fields, women going into the fields, men tempting the unkind Fates, to begin washing operations and publish the recovery per hundred loads. Conceding that diamonds exist in the peridotite, that their quality and lustre are superb, the question recurs:

"How many diamonds per hundred loads will be recovered from a trial washing of 20,000 loads?"

There are "blind pipes," low grade and unpayable "pipes," and "pipes" possessing diamonds in payable quantities; but a "pipe" a mile wide, with "plenty" of the precious stones, gives the palm to Arkansas—or its "expert."

ALEX. GRAY.

A WESTERN AUSTRALIAN PLANT.

In the report of the Western Australia Department of Mines for the year 1906, the treatment plant of the "Associated Northern Blocks, Limited," of Kalgoorlie, is described. This treatment plant is of the "Dry Crushing Type" and is designed to handle the sulphotelluride ore obtained from the "Iron Duke" shoot.

The treatment may be subdivided thus:—

1. Breaking and storage.
2. Milling.
3. Roasting.
4. Grinding and classification.
5. Agitation and cyaniding.
6. Filter pressing.
7. Disposal of residues.
8. Precipitation and clean up.
9. Re-treatment.

Breaking and Storage.—The ore is tipped upon a grizzly, the fines pass through and the oversize goes into a No. 5 Gates' breaker, capacity 500 tons per diem. The products of breaker and grizzly meet at the foot of the breaker and fall on a Robins conveying belt, which distributes the ore evenly over a storage bin of 350 tons capacity.

Milling.—The ore is now fed from the bottom of the coarse ore bin into a row of three ball mills, size No. 5, by means of automatic bump feeders. These mills reduce from 38 to 44 tons of ore per diem and grind it until 50 per cent. will pass through a 150 mesh screen. The crushed ore falls from the mills through a chute into a spiral conveyor, which passes it to the fine ore elevator. It is then stored in a bin holding about 60 tons.

Roasting.—The fine ore is fed from the bin to a double push conveyor by means of another screw, and this in turn pushes it along the line of six Merton roasting furnaces, which have a capacity of 20 tons per diem of ore running 4.5 per cent. of sulphur. The ore after roasting is conveyed by another push conveyor to a Krupp elevator of the chain and bucket pattern, and this elevates it to the height required for all future handling.

Grinding and Classification.—The hot ore falls from the mouth of the elevator into a vortex mixer, where it meets a stream of weak cyanide solution, and is here converted into a pulp consisting of one ton of ore to five tons of solution, and this gravitates to a row of eight Forwood-Dunn grinding pans. Here the grinding is carried on until, approximately, 93 per cent. of the total product will pass a 150 mesh screen. Mercury is added to the pans and a fourth of the gold contents of the ore is collected in the form of a crude amalgam. This passes on to the clean-up room for further treatment in the amalgamating barrel. From here the clean amalgam is pressed into balls and retorted. The bullion averages £4 per ounce.

The overflow from pans runs to the "settlers," where four parts of the solution is separated and again returned to mixer for treatment of a further quantity of ore. The thick pulp is drawn through taps at the bottom and passes on to the agitation plant.

Agitation and Cyaniding.—Here are six vats, each 22 feet diameter and 6 feet deep. One is used solely for re-treatment purposes and the other five for ordinary slime. The pulp is kept agitated here for 16 to 18 hours with cyanide solution of strength 0.06 to 0.08 per cent. cyanide.

Filter Pressing.—The pulp is charged into three 5 ton presses by a three-throw plunger pump, and the washing is done by another pump of the same type. The gold solution after being separated from the ore runs into a large storage tank.

Precipitation and Clean-up.—The gold solution is elevated by centrifugal pumps to another tank at a height of 30 feet, for the purpose of having a steady pressure on the clarifying press. This press removes all fine mud from the solution and it then goes to the extractor boxes. After gravitating through the boxes it is deprived of 47 per cent. of the gold contents and is again ready for use in the plant as weak solution.

For clean-up purposes there are the following:—

One lead lined aciding tank.
One gold slimes filter press.
Two muffle roasting furnaces.
One tilting retort furnace.
One refining mud furnace.
These only come into use once a month.

Disposal of Residues.—This is now done by men trucking from chutes directly under the presses. Owing to the growth of the dump it has been found necessary to instal a belt conveyor, which will elevate to 60 feet. It is set at an angle of 60 degrees.

UNDERGROUND HAULAGE.

(A paper read before the British Society of Mining Students.)

By John Bell.

At collieries having large royalties and seams, worked to a rather inconvenient distance from the shaft for horse haulage, one of the important problems the colliery manager has to face is the introduction of the most suitable system of mechanical haulage to convey a quantity of, say, 1,000 tons of coal to the shaft in eight hours.

This output will not be attained until the seam has been fairly won and developed. A period of 18 months or so is necessary to reach this stage of development, but the adoption of a particular system of mechanical haulage has to be carefully considered and preparations made for it from the very commencement of the winning of the seams and opening out of the intended main roadways.

One thousand tons a day is a fairly good output of coals from one shaft bottom, or from one seam in an eight hour shift, and the following consideration of the subject of haulage is based upon such output.

Very rarely the coal-drawing shaft is situated near the centre of the royalty, and as the area to be worked comprises in many instances 1,000 acres or more, the whole being contained in an irregular shaped plot, the haulage roads sometimes have a distance of from 1 1-2 to 2 or more miles to go before reaching the limit of the undertaking.

To those familiar with extensive underground workings it is well known that the main roads are sometimes driven with many turnings, either to prevent trespassing on other colliery leases, or to avoid the payment of wayleave rents, or to pass well aside of old workings, or the undermining valuable property, injury caused to which may be very costly, etc. Therefore, the distance and direction of the intended main roads, approximate number of branch roads, and necessary curves have to be designed and their intended courses marked upon the working plan after mature consideration of all the influencing circumstances.

Again, it often happens that it is decided upon to win other seams by drifts from the principal one. Also it is a very fortunate colliery that has few or no faults of great or little magnitude to contend with, and consequently these must also be taken into account when deciding upon the system of hauling to adopt.

One important item to consider in which experience is gained as the early workings proceed, is the nature of the roof and sides of the main roads, because upon this more than upon anything else is the final decision made; as a certain method of haulage, much favored by some mining engineers, can only be worked under a very good roof.

Mechanical haulage in Great Britain resolves itself into two systems, *Main and Tail Rope,* and *Endless Rope.*

Endless chain haulage is almost identical with endless rope, but rarely used underground, though perhaps oftener on the surface for short distances. Electric and compressed air motors can only be successfully used in high seams, and therefore are not adapted for British mines, which have haulage roads often not more than 5 feet high. These motors are generally used in American and Canadian mines, but a description of them does not come within the scope of this paper, as there is less likelihood than ever of their being installed in this country.

It has for a long time been a debatable question with mining engineers as to which is the best system of haulage—main and tail or endless rope. Some mining districts in past years have almost exclusively adopted one of these methods, as the North of England with main and tail; other districts, such as the Midland Counties and Lancashire, using endless rope.

Each method can only be a success under certain local circumstances. But naturally we all prefer that system we know best, and from long use are thoroughly familiar with, giving it preference for the intended work we have in view, and which may be afterwards successfully accomplished; although installed by others accustomed to it, a different system of haulage may be even more economical and successful because best suited for the seam. The best results in the after working cannot be obtained by a system carried into effect by those totally inexperienced in its design and installation.

The two systems of haulage we are considering are entirely different from each other. The Main and Tail does not admit of much variation from its general principles, except that sometimes for comparatively short distances or sections along the engine plane from the shaft in which dip gradients inward prevail the tail rope can be dispensed with. But the other method—the endless rope—can be arranged in many different ways, and consequently there is greater scope for ingenuity and invention for those who have to lay it out.

Main and Tail Rope System.

We will first deal with the above system. The Main and Tail rope can be adopted in *all* mines, but the conditions most favorable for the successful working of it are: (1) Straight long engine planes with the branch roads leading off it at some distance from the shaft, thus allowing the sets to attain a high speed. (2) Engine planes having curves of large radius; the engine plane can be formed with any number of curves bearing to the right hand or to the left along its course without extra risk of derailment of tubs, whereas curves are not easily negotiated in the endless rope system. (3) Narrow roadways requiring only sufficient width for a travelling road at one side of a single line of rails. These narrow roadways can be quickly pushed forward with the aid of heading machines if speed of driving is required, and a travelling passage in addition to the necessary refuge holes tends to the safety of the workmen on their way to and from the workings.

Another question rarely considered when comparing the two systems is the time lost by men and boys travelling underground to and from their work where they have long distances to go, sometimes two miles or more before reaching the end haulage station or coal face. Sometimes this travelling—especially if the roads are low—takes up at least an hour each way, and by the time the men reach the face they are much exhausted, consequently valuable time and money producing energy is wasted to the detriment of all concerned. In the system we are considering this can to a great extent be avoided, for the men and boys can be quickly taken inbye fresh to their work by riding in the set and out again when the shift ends, thus giving them the maximum time

for a day's work at the face. Under the endless rope system of slow travelling tubs this cannot be done.

Disadvantages of Main and Tail Rope.—It naturally follows that where sets of tubs, each made up of from 30 to 60 or more in number, travelling at a high speed for long distances to and from the shaft at frequent intervals, accidents will now and again happen, either from derailed tubs, breakage of couplings, ropes, or wheels, loose rollers, falls of stone, switches turned the wrong way, and from other causes, resulting in a stoppage of work for a period of half an hour or longer. Extra length of shaftings and also of sidings at the inner end of haulage stations must be made to hold a surplus number of tubs in case of accidents, to ensure regularity of work without delays.

Also the intermittent nature of the running in bringing the loaded tubs to the shaft is a disadvantage. More steam for the time being is required, and a large engine, whilst the wear and tear of material is rather high.

Branch Roads.—The working of branch roads for this system is much simpler than it is for the other method. No connecting driving wheel is required at the junction, only a return wheel at the branch engine plane terminus for working the rope. The connection of the ropes to those working the main engine plane being simply and quickly done by the offtake boy stationed at the junction. In order to facilitate the haulage where it is necessary to win large tracts to the right and left of the main engine plane, it is best to turn the branch roads from the main haulage road nearly opposite each other, but in practice this may not always be possible.

Every one of these roads is either driven from the main way by means of a carefully made curve, or the connecting curve is made later before the working of the branch begins. The haulage rope for it is laid from the junction, inward, over a return wheel at the far end and back again. Each end of this rope is provided with a split link. These links are exactly opposite two similar links on the main and tail ropes when the journey of full tubs is at the shaft, so that all that is required is to disconnect the main and tail ropes at these links, and join on the branch ones, using a small hand winch to draw the main and tail joints to a position opposite each other if they are not quite up to their mark, change the switches and rap the set in to the landing.

These junctions are generally called offtakes. A boy is stationed at each offtake, whose duty it is to divert the sets into the branch road, for which purpose he telephones to the shaft, and changes the switches and ropes.

Shaft Sidings.—Main roads and shaft sidings should be turned away if possible at right angles 10 or 12 yards distant from the shaft.

Owing to the large number of tubs travelling by this system it is necessary to make long shaft sidings and also inbye landings to store them. Suppose sets of 60 tubs are run, then the sidings must be long enough to contain 60 + 20 spare tubs which sometimes remain undrawn in front, and also an additional length of 30 yards at the inbye end to allow of clearance or for a rising gradient. Tubs which contain 10 cwt. are 5 feet 2 inches long, including coupling chain. ∴ 5 feet 2 inches × (60 + 20) = 413 1-3 feet, say 138 yards + 30 = 168 yards, thus making the length of shaft sidings 168 yards.

If coal is drawn to both sides of the shaft then the same arrangements must be made also at the other side.

The sidings are divided lengthways into two parts, each sloping in opposite directions. The higher portion known as the "kip" is for the full tubs, and is made to fall towards the shaft at a gradient of 1 in 72, so that a loaded tub may run by gravity to the shaft. The road for empty tubs is formed with a falling gradient *from* the shaft for about four-fifths of the length of the siding, rapidly rising at the far end. This depression is called the "dish," and is about 4 yards wide.

Inbye Landings.—These landings do not take much making and need only be wide enough for a double road, with a travelling way for men and ponies between them and sufficient clearance from the timbers at the side; 3 1-2 yards is generally wide enough. They must also be long enough to contain a full set of 60 tubs, and additional length to accommodate other 20. Consequently the total length will be about 138 yards.

Spring switches instead of the old lever switches are laid at the entrances to landings, and at the inbye end of shaft sidings.

Intermediate Collecting Stations alongside Main Roads—Sometimes it is necessary to open out a small district on one or on both sides of a main haulage road. In either case one landing laid alongside the engine plane will suffice. Such landing can be formed without much trouble if the roof is good by taking coal from both sides of the main way, thereby increasing the width sufficiently to allow an extra road to be laid along each side of the haulage road for a length of 138 yards. There must be sufficient space between these roads to allow tubs to travel freely at a high speed along the main haulage road. A width of 4 1-2 yards would be required for this purpose under the given conditions. Movable clams[1] crossing the main road allow the tubs to be taken from one side to the other as required, ordinary switches being used at the top end to direct the tubs in or out. (See Fig. 1.)

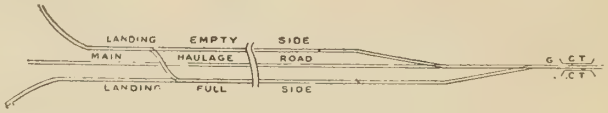


Fig. 1.

Arrangement for Landing on a Through Main Haulage Check Table.

G—Greaser. C T—Check Table.

floor level of the curve a series of revolving horizontal

Laying out and working Curves.—Curves on haulage roads are a necessary feature in mines, and require careful laying out. The curved debouchure of a branch road is generally made a little wider than its continuance. A long row of strong props is securely fixed between roof and floor, from 3 to 4 feet apart, all round the curve on the inside of the inner rail; then strong horizontal deals are nailed to them, one deal length extending from prop to prop at a height from the floor slightly less than that of the tub. On these deals a thin iron or steel rubbing plate 6 inches broad is nailed, and placed in such a position that the tubs passing to and fro rub against the metal all the way round the curve. At

[1]Clams are long bridge rails, more or less curved, as required, moving on pivots at one end and connected to the rails on a branch road. These clams then go over the top of the principal haulage road rails, and their free ends are widened out and sharpened. These ends can be moved into position over the top of the main road row of rails at any point required, thus allowing tubs to be diverted without any check into the first branch heading.

drums, 4 feet in diameter and 9 inches in height, are placed for guiding the rope, so that the latter rubs against and causes the drums to revolve, thus reducing friction as it moves in either direction. Along the whole length of the curve between the props and coal side vertical sheaves are fixed at intervals of 8 yards, for guiding and reducing the friction of the tail rope. (See Fig. 2.)

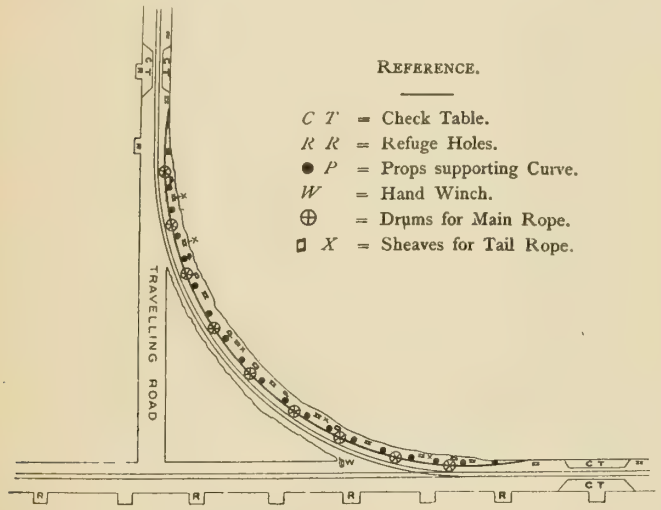


Fig. 2.
Curve for Main and Tail Rope System.

Return Wheels. — Unlike the erection of return wheels in endless rope haulage, that of the Main and Tail system can be quickly and effectively made secure. In order to do this it is necessary to fix two strong balks at a sufficient distance apart for the insertion of the wheel between the balks being well let into the roof and floor to a depth of 2 feet above and below, so as to give the balks a slight inclination. The balks are spaced apart by having a distance-piece bolted to them at top and bottom, and at their centres are attached bearings to take a large grooved pulley 5 feet in diameter between them. This wheel must be securely fenced in. Sometimes this pulley wheel is fixed in an horizontal position below the floor of the road, but the writer is of opinion that in order to resist the tremendous pull exerted upon this pulley when the sets are running, heavily loaded at a high speed up a steep gradient, the vertical position is much stronger than the horizontal. It can also be better examined and oiled than when laid under the floor of the roadway and boarded over. Again, the vertical position offers better facilities for connecting another rope pulley on to it, if the occasion to use a rope-driven pump for forcing water out by, should arise at any time. If the use of such pump were adopted it could be worked when the haulage rope was running.

Haulage from Workings Proceeding in the Direction of Dip.—Sometimes small districts or flats to the dip have to be worked, and the coal therefrom brought to the end of the main haulage road. In such a case an economical method of conveying the dip coal may be obtained by forming a two-way siding capable of holding from 15 to 30 tubs depending upon the gradient, distance, and size of district at a suitable place in the workings, and connecting this siding with that at the end of the main haulage road by an engine plane for direct haulage, which could be worked by means of an additional rope from the landing inside siding. The sets of tubs can be made ready, the one at the end of the main haulage road for transference to the shaft, the other at the inside siding for transference to the main haulage road. The two ends of the rope then lying on the floor of the direct haulage road are attached, one to the hind end of the set of tubs going to the shaft, the other to the front end of the set at the inside siding. This rope then connects the two loads, it having a slip bolt and pin, or a dog as it is called, at the outby end for easily disconnecting it from the main set.

The engine in hauling out the main set at the same time also pulls out the smaller one to the top end of the landing, where the inside rope-end is attached. It is, however, necessary to slow down or stop the shaft set while the disconnection is being made, owing to the great length of the main haulage road compared with that of the direct. A single horse may be employed to pull in the required number of tubs securely dragged or scotched to the siding, the rope being attached and trailed in behind the set, so that in this way much horse labor is saved. Or, if the gradient is suitable for the tubs to be run in by gravitation, the use of a horse will not be required at all. In that case the gradient must be uniform, and such as to ensure the tubs spragged or unspragged descending the road gently.

Check Tables.—In both systems of haulage it is necessary to have check tables laid at distances of about 200 yards apart on the main road, and always at the entrances to landings or sidings, and at both ends of curves. These are made of wood 6 feet in length measured over the rail, and 4 inches in height, and are firmly fixed to the floor and sides, so that when any derailed tubs either full or empty reach the check tables they are directed on to the rails again.

Automatic Tub Greasers.—These are fixed at the entrances to the landings, and also at both ends of the shaft sidings, for full and empty tubs. These to a considerable extent reduce the friction of the tub axles, and are of great benefit to the putters and horses.

Friction Rollers.—Rollers of iron and wood are fixed at suitable distances apart to keep the ropes off the roads and reduce friction. They are generally placed from 8 to 10 yards apart on the main way. Iron or steel rollers are best on heavy gradients as they last much longer, wooden ones being better on level roads. They are generally arranged thus:—Every three succeeding rollers throughout the engine plane consist of one iron one followed by two wooden ones. They should be fixed in suitable boxes, which are firmly placed in the holes sunk in the floor, instead of as is frequently done, nailed to stretcher-pieces reaching from sleeper to sleeper, and consequently easily torn up by derailed tubs, afterwards often to cause the derailment of others. Rollers are 5 inches in diameter and 9 inches in length.

Grooved sheaves from 12 to 15 inches in diameter and 3 inches in width are used for the tail rope, and are placed from 10 to 12 yards apart.

Refuge Holes.—For this system of haulage, where there is very little spare room between the tubs and the coal side, the Coal Mines Regulation Act requires refuge holes to be at no greater distance apart throughout the length of the engine plane than 10 yards. These refuge holes should all be on the *same* side of the road, and opposite the side the rail rope travels along. They must be kept perfectly clear from deposits of rubbish, timber, and in-filling of every description, and should be frequently whitewashed, so that they can be readily seen in cases of emergency.

Automatic Detaching Hook and Safety Bar Attached to the "Sets."—To the fore end of the leading tub of

every full set an automatic detaching hook is fixed. This is made of wrought iron. The low portion has a link which fits in to the coupling hook of the tub; another half link on a swivel can be turned up and made fast by a collar. To this the main rope is attached. On the top is a crook which fits on the tub end. A bell crank lever at this point has a chain connected to the collar. As the first tub of an outgoing set approaches to within 40 yards of the shaft the lever strikes a horizontal bar and is forced over; this action lifts the collar and detaches the rope, which falls over the "kip" side, allowing the tubs to run by gravity to the shaft. (*See Fig. 3.*)

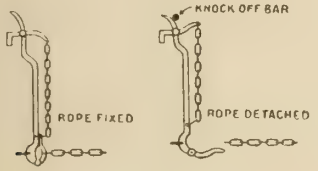


Fig. 3.

Automatic Detacher for Main Rope.

Where full tubs have to be hauled up heavy gradients a strong trigger is attached to the hind end of the last tub. This is a bar of iron 1 1-2 inch in diameter and 3 feet in length, suitably bent. One end is fixed to the tub at a point two-thirds the height of the tub from the floor, the other having two fangs rests on the tail rope. If the couplings or the main rope breaks the fangs slip off the rope as the tubs run back and the pressure forces the fangs into the floor or into a sleeper and throws the last tub off the rails; this stops the other tubs from running wild down the declivity and prevents much damage from being done.

Run-Rider.—A boy 17 or 18 years of age is frequently employed as rider on a set. His duty is to see that the set is immediately stopped in case of accident from derailed tubs, broken rope, etc. He also attaches the rope to the leading end of every set and sees that all are ready for its journey in or outbye. The duties of this attendant are often dangerous and his services should be dispensed with wherever possible, especially on heavy gradients.

Signalling.—In all methods of haulage, electric signals and telephones are placed for use between the shaft and the engine-house at one end to all inbye landings.

Automatic Chocks and Catches.—Over portions of an undulating engine plane, the rising gradients for full or empty tubs are provided with some means for preventing the tubs from running back. Spring chocks and automatic catches are used for this purpose. The former are best for light gradients, the latter for great inclinations. Spring chocks are made for a piece of wood, 8 feet in length, 9 inches in width, and 3 inches in thickness. Upon this plank the spring proper is fixed. It is made of elm, 4 inches deep, tapering from 3 inches wide at that extremity which is fastened to the bottom piece by two bolts to 1 inch wide at a point near the other end where it widens out again. This free end is in contact with the side of a wooden chock, plated with iron and pivoted at one end to the plank below by means of a bolt. A short chain prevents this chock from coming out too far, and thus ensures continual contact between the spring and the chock, but the action of the spring when not forced back always presses against the chock sufficiently to cause its unpivoted end to project slightly beyond and over one rail of the tub road. The tubs in passing the chock force it back, but as each wheel clears the chock, it springs out again and crosses one rail, so as to form an effectual stop to the return of tubs. These spring chocks are always fixed between the rail and coalside. (*See Fig. 4.*)

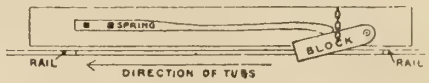


Fig. 4.

Automatic Chock.

Automatic catches, shown in Fig. 5, are fixed midway between the rails. They are simply made, and each consist of an iron bar fixed slantingly to work on a pivot attached to a thick sleeper. The heaviest and longest part of the bar works in a cavity in the floor; the upper portion projects above the tub axles. As each axle passes over it, the bar is depressed, but as soon as the tub has passed byond it, the catch rises again owing to the superior weight of the portion below the pivot, and thus

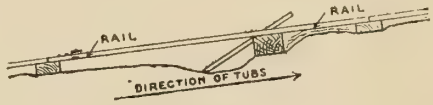


Fig. 5.

Automatic Catch.

prevents the tubs from returning. Ordinary stopblocks, plated with iron, the longer piece crossing one or both rails, are also used for preventing tubs from running back.

Automatic Doors on Haulage Roads.—It is sometimes imperative to have doors on main haulage roads for ventilation purposes. Needless to say, only the strongest necessity excuses their use on such roads, and where heavy canvas doors are not satisfactory, then wooden ones should be erected. There must always be two doors fixed distant from each other rather more than the length of a full set of tubs, so that the space between allows of the whole set passing through one door before the leading tub reaches the other.

Formerly trapper boys were employed to open and shut these doors when required, as the sets were approaching and were not to be stopped; but the work was always a source of danger to the lads, and accidents often happened either through carelessness or ignorance.

Consequently, self-closing doors were invented which could be opened automatically from either side by the approaching sets of tubs. The following description will be understood by reference to Figs. 6 and 7, which are a plan and elevation respectively of them.

These doors are made in halves on overhead travelling pulleys moving on rails in the upper frame; the leading tub of an in-going or out-going set forces them asunder before quite reaching them. On each side of each half of the door an iron bar 12 feet long is fixed horizontally at a height above the floor equal to half the height of the tub and secured at one extremity to the door by a hinge so arranged that the bars act from either side of the doors as required by the approaching set. The ends of the bars farthest from the doors work in eyebolts

fixed on vertical posts having plenty of room to slide through them.

The rails on which the pulleys run are inclined towards the centre of the road, so that the doors are forced upwards and at the same time sideways by the

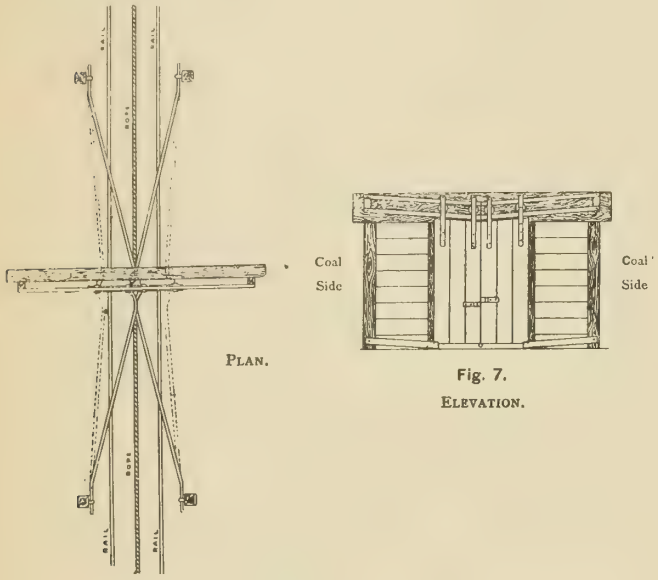


Fig. 7.

6.

AUTOMATIC DOORS

passing set, which on coming into contact with the bars pushes their inner ends apart carrying the doors with them, which close by gravity after the last tub is though. The main rope travels through a small opening left at the bottom of the two halves. The tail rope runs through a small hole in the casing between the doors and the side of the way.

Method of Finding Size of Engine Required for Main and Tail Rope Haulage.—Suppose 500 tons a day have to be hauled up an incline rising 1 in 6, 1,200 yards long, in five hours, steam pressure 60 pounds at the engine, coefficient of friction 1-20th.

500 tons in 5 hours = 100 tons an hour. Assume speed of sets 10 miles an hour equals 880 feet per minute. Time for set to run 1,200 yards. $1,200 \times 3 \div 880 = 4.09$, say 4 minutes.

Empties take the same length of time. ∴ a set is run in 8 minutes. 8 minutes a set = $60 \div 8 = 7$ 1-2 sets per hour. .. $100 \div 7$ 1-2 = 13 1-2 tons a set.

Assume 10 hundredweight tubs, each have a tare of 4 1-2 hundredweight. 27 tubs are required to carry 13 1-2 tons. Total weight of coal and tubs = 27×4 1-2 $\div 20 = 6.07$. .. $13.33 \times 6.07 = 19.40$ tons.

On a gradient of 1 in 6 these full tubs exert a pull of 19.4—6 = 3.23 tons, neglecting friction. To find size of rope, a factor of safety being 6. ∴ rope must have a breaking strain of $3.23 \times 6 = 19.4$, say 20 tons. A suitable rope for this will be 5-8 inch diameter, and weigh 2 1-4 pounds per yard. Total against engine, including gradient and friction, will be—

Full tubs, 19.4 tons ÷ 6 = 7,242.66 pounds.
Rope, 1,200 × 2 1-4 ÷ 6 = 450 pounds.
Full tubs, 19.4 tons ÷ 30 = 1,448.5 pounds.
Rope, 1,200 × 2 1-4 ÷ 30 = 90 pounds.
Total number of pounds 9, 231.16.

To this total we add 50 per cent. for general resistances. ∴ 9,231.16 × 50 per cent. = 13,486.74 pounds. Rope travels 880 feet per minute. ∴ 13,846.74 × 880 = 12, 185,131.2 foot pounds of work the engines must do.

Piston speed to be 250 feet per minute. ∴ 12,185,131.2 ÷ 250 = 48,740.5 pounds of work done at one revolution.

Steam pressure, 60 pounds. ∴ 48,740.5 ÷ 60 = 812.34 square inches is the area of *both* cylinders. ∴ area of each is 406.17 square inches.

Diameter of each cylinder = 22.8 inches, and stroke 45 inches.

Number of revolutions, $250 \times 12 \div 90 = 33$ 1-3 per minute.

Size of drum, 880 ÷ 33 1-3 ÷22 ÷ 7 = 8.4 feet diameter.

.. dimensions of engine.

Double cylinders, 22.8 inches diameter, 45 inch stroke, 33 1-3 revolutions per minute. Drums, 8.4 feet diameter.

Endless Rope Haulage.

Endless rope has been called the ideal system of underground haulage by those persons who have become experienced in its use, more especially if the conditions have been favorable for its adoption.

It certainly has in some instances advantages over the main and tail system, but, unlike the later, it cannot be adopted in every seam.

Disadvantages of its use.—It requires a continuous double line of way, one side solely for full tubs coming outbye, the other for empties going in to the workings, together with extra width for a travelling way. It cannot, therefore, be used in seams having weak roofs, necessitating a narrow engine plane. Again, despite what may be said to the contrary, under certain methods of fixing the tubs to the haulage rope, curves are not so easily worked as in the main and tail system. More tubs are required, and more boys must be employed. The rope must be kept tight and adjusted by means of tension screws or bogeys, these being generally, but not necessarily, placed at the inbye end of the terminus. The working of branch roads sometimes is a source of trouble unless the connecting pulleys and switches are carefully laid out. Owing to its slow speed workmen cannot be quickly conveyed in or outbye to or from their work by means of the tubs; so that their working time—a source of profit to both themselves and the owners—is reduced. This is an important factor where working places in large collieries are 1 1-2 to 2 1-2 miles from the shaft. The clips frequently are a source of trouble, especially on heavy gradients, for they are liable under the heavy stress prevailing to become detached, causing the tubs to run a-main, or leave the rails. A constant clipping of the rope injures it by compression, making its life shorter than otherwise it would be, whilst broken strands are of frequent occurrence, causing stoppage of work and frequent repairs.

(To be continued.)

D. A. Thompson, M.P., has arrived at Ottawa from Dawson to attend the Parliamentary session. Referring to conditions in the Yukon, Dr. Thompson expresses a very optimistic view of the future of the country and anticipates a large annual production of gold, at least equal to the best past records in this respect, at no very distant time. One corporation alone last year employed 1,500 men in conection with equipment operations, while next year a still larger force will be engaged. Dr. Thompson, moreover, does not agree with the generally expressed opinion that the day of the individual miner in the Yukon is over; for, he maintains, there are still rich fields, which may be developed by individual effort.

IRON ORES, PIG IRON AND STEEL.

By Edwin C. Eckel.

(Abstract from advance chapter from "Mineral Resources of the United States," for 1906.)

Introduction.

The year 1906 witnessed a steady growth in production in all branches of the iron industry, from ore to finished products, previous records being broken in production of ore, pig iron and steel. Coincident with increase in production came increase in prices, which rose steadily from the begining to the end of the year, with the exception of a slight depression in June. These movements in output and price must be regarded as continuations of the growth shown during 1905, and their relations to the past history of the iron industry, can be noted on comparison of the records of the industry for a number of years preceding.

The chief factors in keeping prices down to a reasonable level have been, curiously enough, the great iron and steel producing corporations. Their attitude in this matter is not, of course, dictated by altruistic motives, but it affords a refreshing contrast to the method of procedure which a few years ago would have been considered to be the immediate consequence of the consolidation of interests in any industry. Realizing that steady sales at reasonably high profits are in the end better than a runaway market with its consequent great fluctuations in both prices and sales, all efforts have been made to steady the iron market so far as is possible, and until within a very recent period this policy was markedly successful. Toward the very close of the year, however, prices in several lines rose more sharply than is generally considered advisable, and it is doubtful as to how far control would be possible in 1907 in case generally prosperous business conditions should maintain a high demand for iron and steel products. It is known, moreover, that heavy increases in production will be possible during the latter half of 1907 and in 1908, and the probabilities are therefore in favor of lower rather than of higher prices in the near future.

Production.

The iron-ore production of the United States in 1906 amounted to 47,749,728 long tons, valued at $100,597,-106. As compared with 1905, the most productive previous year, this was an increase of 12.28 per cent. in tonnage and of 33.83 per cent. in value.

Varieties of Iron Ore Produced.

The iron minerals which are used as ores of that metal fall, when considered from the chemical point of view, into two classes—oxides and carbonates. The latter are relatively very unimportant in the United States, furnishing less than one twenty-fifth of 1 per cent. of the total output. The important group of oxides, moreover, is separable on both commercial and scientific grounds into three sub-groups, the ores of which differ in composition, grade, and geologic associations.

The final grouping used in this report, therefore, is as follows, the varieties being named in order of their present productive importance:

1. *Red hematite*: Including all the anhydrous sesquioxides known locally as red hematite, specular ore, fossil ore, oolitic ore, etc.

2. *Brown hematite*: Including limonite, gothite, and other hydrous sesquioxides known locally as brown iron ores, bog ores, etc.

3. *Magnetite*: Including the magnetic oxides.

4. *Carbonate*: Including the iron carbonates of various types.

Production of iron ore in the United States in 1906, by States and varieties, in long tons

State.	Brown hematite.	Red hematite.	Magnetite.	Carbonate.	Total. quantity.	Total value.
Alabama	821,301	3,173,797	.....	.....	3,995,098	$5,123,539
Arkansas and Texas	*c*36,660	.....	.....	.....	36,660	36,660
Colorado	14,078	.....	.....	.....	14,078	22,525
Connecticut and Massachusetts	31,343	.....	.....	.....	31,343	94,129
Georgia	305,624	105,606	.....	.....	411,940	734,780
Kentucky, Maryland, and West Virginia	18,895	27,433	.....	612	46,940	58,175
Michigan	.....	11,822,874	.....	.....	11,822,874	31,145,087
Minnesota	.....	25,364,077	.....	.....	25,364,077	51,799,256
Missouri	41,805	39,105	.....	.....	80,910	158,109
Montana, Nevada, New Mexico Utah, and Wyoming	.....	*d*620,635	171,555	.....	*e*792,190	946,551
New Jersey	20,611	.....	521,907	.....	542,518	1,570,578
New York	1,000	128,385	912,607	.....	1,041,992	2,635,639
North Carolina	.....	.....	56,057	.....	56,057	75,638
Ohio	.....	.....	.....	17,384	17,384	29,706
Pennsylvania	134,027	8,854	806,548	.....	949,429	1,246,267
Tennessee	590,763	279,971	.....	.....	870,734	1,307,433
Virginia	735,204	92,257	620	.....	828,081	1,579,817
Wisconsin	29,752	818,381	.....	.....	848,133	2,033,217
Total	2,781,063	42,481,375	2,469,294	17,996	47,749,728	100,597,106

c Texas alone. *d* Includes a small quantity of brown hematite. *e* Includes some ore used as smelter flux.

Value of Iron Ore Per Ton.

The following table presents data on the value per ton of the different varieties of iron ore in the various producing States. The values given are intended to represent value at the mouth of the mine, and are taken directly from the replies of the producers. It is probably unnecessary to caution the reader that any such table must be accepted as merely a fair approximation to the truth. The element of inaccuracy arises from conditions in the iron-ore business and can not be readily overcome. By far the bulk of the iron ore produced in the United States is mined directly by pig-iron producers for use in their own furnaces, and the valuation which they place on such ore is therefore entirely a matter of accounting. In some cases the reports made to the Survey evidently include merely actual mining costs; in others they contain an allowance for sinking funds; and in still other instances the values given are obviously merely convenient prices to use in charging costs against the blast furnaces.

It is noted, however, that the errors are almost entirely in one direction—that of undervaluing the ore rather than of overvaluing it. If all the American iron ore were to bought by iron furnaces in open market from an entirely distinct set of iron miners, the average prices paid would probably be considerably in excess of those now reported.

Average value per long tone of iron ore in the United States in 1906, by States and varieties.

State.	Brown hematite.	Red hematite.	Magnetite.	Carbonate.
Alabama	$1.62	$1.19	....	....
Arkansas and Texas	a1.00	....	....	....
Colorado	1.60	....	....	....
Connecticut and Massachusetts	3.00	....	....	....
Georgia	1.86	1.57	....	....
Kentucky, Maryland, and West Virginia	1.52	1.01	....	$3.00
Michigan	....	2.63	....	....
Minnesota	....	2.04	....	....
Montana, Nevada, New Mexico, Utah and Wyoming	....	1.14	$1.39	....
New Jersey	2.46	....	2.91	....
New York	4.00	2.40	2.55	....
North Carolina	....	....	1.35	....
Ohio	....	....	....	1.71
Pennsylvania	2.33	2.42	1.14	....
Tennessee	1.62	1.26	....	....
Virginia	1.90	1.94	3.08	....
Wisconsin	2.17	2.41	....	....
Total average	1.78	2.13	2.05	1.75

a Texas alone.

Stocks of Ore at Mines.

The stock of ore on hand at mines on December 31, 1906, amounted to 3,281,789 long tons, a decrease of 13.92 per cent. from the stock held on December 31, 1905—3,812,281 long tons, which in turn was a decrease of 18.31 per cent. from the quantity in stock on December 31, 1904. The stock in 1906 represented about 6.8 per cent. of the total output of the year.

Stock of iron on hand at the mines December 31, 1906, by States, in long tons.

State.	Quantity.
Alabama	24,034
Georgia	2,061
Maryland	225
Massachusetts	3,300
Michigan	1,991,074
Minnesota	996,902
Missouri	2,950
Montana and New Mexico	1,900
New Jersey	5,608
New York	87,663
Ohio	15,573
Pennsylvania	11,365
Tennessee	36,230
Texas	6,000
Virginia	460
Wisconsin	96,444
Total	3,281,789
Total stock, 1905	3,812,281
Per cent. of decrease, 1906	13.92

Iron Ore Reserves of the United States.

About two years ago, in response to a request from the Swedish Parliament, an eminent Swedish geologist prepared a report on the iron ore reserves of the world. The report itself attracted little notice in the United States, even among those directly interested in the iron industry. Early in 1906, however, a summary of the report was forwarded by the American consul at Paris, and the wide circulation given to consular reports in America resulted in drawing considerable attention to the matter in both the daily and the technical press.

The character of the report in the form in which it reached the American public is fairly indicated by the following extracts:

It will surprise a great many to learn that we are likely to run short in iron inside of a single century, if we keep up the present rate of consumption. As a matter of fact we are more likely to increase the consumption than we are to reduce it. The world has only 10,000,000,000 tons of iron ore available. Of these Germany has twice as many tons as the United States. Russia and France each have 400,000,000 tons more than this country. * * * Assuming therefore as true the claim of geological science that the extent of workable iron ore beds is known to within a margin of possible error not exceeding 5 per cent., the Swedish report, which is based upon the most authoritive information, has naturally attracted world-wide attention. * * * The present output of ore and the amount of ore actually consumed by each is as follows, in tons:

Country.	Workable deposits.	Annual output.	Annual consumption.
United States	1,100,000,000	35,000,000	35,000,000
Great Britain	1,000,000,000	14,000,000	20,000,000
Germany	2,200,000,000	21,000,000	24,000,000
Spain	500,000,000	8,000,000	1,000,000
Russia and Finland	1,500,000,000	4,000,000	6,000,000
France	1,500,000,000	6,000,000	8,000,000
Sweden	1,000,000,000	4,000,000	1,000,000
Austria-Hungary	1,200,000,000	3,000,000	4,000,000
Other countries	1,200,000,000	5,000,000	1,000,000
Total	10,000,000,000	100,000,000	100,000,000

While it is probable that the foregoing statement does not take into adequate account the undeveloped ore deposits of Utah and Alabama, its teachings are nevertheless obvious and impressive. Of the world's workable iron ore deposits, as at present known, the United States possesses only about one-ninth, and at the present rate of consumption the entire supply will be exhausted within the present century.

It must be admitted that an official statement such as this might fairly cause alarm to those unacquainted with the facts of the case and that the daily press can not be blamed for taking the matter very seriously. As a matter of fact, however, the figures given can not be accepted as reliable, and it seems desirable to present a more careful statement of the case. The original Swedish report did not do justice to the American iron ore deposits, and in the consular translation this injustice was accentuated rather than lessened.

Before taking up the subject of American iron ore reserves in general it may be well to dispose of one statement in the quotation: "Assuming therefore as true the claim of geological science that the extent of workable iron ore beds is known to within a margin of possible error not exceeding 5 per cent. * * *." This assumption appears to be entirely gratuitous. No mining geologist of any experience would make such a claim, except for very small or unusually uniform ore bodies. Elsewhere, in discussing the Clinton or red ores of Alabama, the writer has said: "The amount of Clinton ore in any area can probably be determined by a geologist within 5 or 10 per cent., and estimates of red ore reserves can therefore be made by competent men with a degree of accuracy impossible in dealing with the magnetites, hematites, or brown ores of other districts." The Clinton ore it must be remembered is an exceptionally easy ore to estimate, because it occurs in bedded form and is fairly uniform over considerable distances, both vertically and horzontially. In dealing with irregularly shaped bodies, an estimate which came within 25 per cent of the actual quantity might well be considered remarkably accurate. When, however, the estimate covers not a single area or deposit, but the total iron ore contained in a State or nation, the case is very different, for the possibility of error in such an estimate is enormous. As will be shown below, the Swedish report on iron ore reserves probably contains an error of something over 1,000 per cent. in its estimate of American ore tonnage.

The Lake Superior district, at present the leading American producer, has been explored more thoroughly than any other ore field in the United States, but estimates as to total tonnage range within rather wide limits. At present the totals commonly quoted vary from 1,500,000,000 to 2,000,000,000 tons, of which the United States Steel Corporation is commonly supposed to control over three-fourths. This supply is being drawn on to meet a constantly increasing annual demand, and it is conceded that before 1915 the district will probably be called upon to ship over 50,000,000 tons of ore a year. It is obvious that at such a rate the Lake Superior ores can hardly be expected to last beyond the year 1950, and it is equally obvious that long before that date the value of good workable deposits of iron ore, both there and elsewhere in the United States, will have increased immensely. During the past year ore lands in the Lake district have been sold at a valuation of $1 per ton of ore in the ground, though the average valuation is still, of course, considerably below that price.

In the Rocky Mountain and Pacific States a few large iron ore deposits are known to exist, and many others are reported, but any attempt at any estimate of total tonnage would be, with only our present knowledge of the subject, merely the wildest sort of guessing.

A more promising field lies in the older Eastern States. It is probable that careful exploratory work will develop magnetic iron ores in New York, New Jersey and Pennsylvania in quantities far in excess of anything usually considered possible in those States. Here also close estimates are impossible.

With regard to the southern iron ores the case is very different. Here the work which the Geological Survey has carried on during the last three years and which was planned so as to obtain data on the quantity of ore available, gives a fairly secure basis for tonnage estimates. It is safe, therefore, to submit the following figures as representing minimum values for the workable iron ore reserves above the 1,000-foot level of certain Sourthern States, with the caution that further exploratory work in the South will probably greatly increase rather than decrease these estimates:

	Red ore.	Brown ore.
Alabama, long tons	1,000,000,000	75,000,000
Georgia, olng tons	200,000,000	125,000,000
Tennessee, longs tons	600,000,000	225,000,000
Virginia, long tons	50,000,000	300,000,000
Total, long tons	1,850,000,000	725,000,000

This gives a total estimated reserve, for the red and brown ores of the four States noted, of over 2,500,000,000 tons. If to this we add the ores occuring at deeper levels in the States named, and also the red and brown ores of Maryland, West Virginia and Kentucky, and the magnetic ores of the other Southern States, it is probably fair to assume that the total southern ore reserve will amount to very nearly 10,000,000,000 tons, or five times that credited to the Lake Superior district. Much of this ore is of course unworkable at the present day, but all of it should be counted on in any estimate of total ore reserves.

In considering these figures it will be well to bear in mind that the southern red ores will average from 33 to 43 per cent. metallic iron, but that they carry so much lime as to be almost or quite self-fluxing. The brown ores, as washed, will range form 40 to 50 per cent. metallic iron. It may be further added that the estimates as to red-ore tonnage are probably much more accurate than those relative to brown ores.

To sum up the matter—in place of the 1,100,000,000 tons credited by the Swedish geologist, it is probably safe to say that the United States has from ten to twenty times that reserve of iron ore.

The present rate at which our ore is being mined is as follows:

1903, tons	35,019,308
1904, tons	27,644,330
1905, tons	42,526,133
1906, tons	47,749,728

Assuming that the demand for iron ore during the present century may range from 50,000,000 to 100,000,000 tons per year, the Lake Superior district would last for from twenty-five to fifty years more, if it supplied the entire United States. But counting on the known reserves elsewhere in the United States, the ore will last for a much longer period, though, of course, it must necessarily show a gradual but steady increase in value and in cost of mining, along with an equally steady decrease in grade. No attempt is here made to consider

a very important factor in the problem—the extent to which Cuban, Haytian, and other high-grade foreign ores may be imported in the near future.

Recent Technologic Advances.

Of processes affecting the iron industry the three which have received most attention during the last few years are probably the Gayley dry blast, electric smelting and nodulizing. The first of these is in successful operation at a number of furnaces, and is now hardly subject to discussion as a new or untried process. With the other two the case is different, and some space may profitably be devoted to a brief discussion of their probable status in the iron industry.

Electric Smelting.—There is of course nothing particularly novel in the idea of producing iron or steel in the electric furnace, though some recent experimenters appear to ignore this fact and to consider the mere electrolytic production of metal to be the mark of success. The real point is to produce metal in the electric furnaec cheaper than in the blast furnace, and concerning this possibility a great deal of discussion has taken place, often in a purely academic fashion, without much experimental basis. During the past two years, however, a number of experimental plants have been operated in various parts of America and Europe, and our knowledge of the problem is fast assuming a definite shape. Recent exhaustive discussions of the subject by Haanel, Harboard, Kershaw, and others seems to warant the following conclusions:

(1) Under the conditions which obtain in most of the settled portions of the world, neither pig iron nor ordinary structural steels can be produced in the electric furnace at a cost to compete with the blast furnace.

(2) Under exceptional conditions, where ample water power can be very cheaply developed in the immediate vicinity of the ores and when fuel is very dear, pig iron and steel can be produced profitably in the electric furnace. Harboard estimates that with electrical energy costing $10 per electrical horse-power year, and with coke at $7 per ton, the two methods are about on an equality.

(3) Electric smelting may be practicable in the case of titaniferous ores or of other ores difficult to treat in the blast furnace, if the resulting product possesses any properties which would counterbalance the increased cost.

(4) Electric smelting methods can be profitably applied to the manufacture of crucible steel or of other high-grade special steels and ferro-alloys.

It will be seen, therefore, that there is little prospect that electric smelting will have much influence on the general development of the iron and steel industries until fuel supplies become much scantier than they are at present. Considerably more practical results to the industry can be expected from the process next to be considered, though it bears on an entierly different phase of the iron manufactuer's problems.

Nodulizing.—In all furnaces, and particularly in those running on soft or fine ores, a very appreciable quantity of iron ore is carried out by the blast. This ore dust, which may amount to 5 per cent. or more of the furnace charge (equivalent to from 25 to 50 tons per day per furnace), is usually trapped before entering the stoves, so that it can be removed and stored. Its fineness, however, precludes its direct use in the furnace, and hitherto the only method of utilizing it involved the preparation of briquettes. The "nodulizing" process does away with certain difficulties inherent in any regular briquetting process and seems likely to come into general use as a means for economically handling flue dust. It is of service also in other fields, for it can handle the finer material produced during magnetic concentration, and it renders available certain sulphurous products (blue billy, sulphury ores, etc.) ,which have hitherto been treated with difficulty.

The principal novel point in connection with this process is that it employs rotary furnaces closely similar to the rotary kilns now so familiar in the Portland cement industrq. These kilns are set slightly inclined; the fine ore is fed in at the upper end and travels toward the lower end as the kiln revolves slowly. Fuel is sprayed in at the lower end, so that a high temperature is produced there. So far the process is exactly similar to that employed in cement practice. The point of difference lies in the fact that a hydrocarbon or other binder is dropped or sprayed into the ore as it is fed into the upper end of the kiln. As the materials slowly pass downward the binder mats the ore into little masses or nodules. Farther down in the kiln the greater heat causes the tar to combine with the sulphur, if the latter be present, and the two are largely volatilized. Still closer to the discharge end practically all of the binder has disappeared, but the ore nodules, now free from sulphur, still cohere, owing to incipient fusion of their particles, for the heat here approximates to 2,000 degrees F.

It will be seen that this "nodulizing" accomplishes both the consolidation and the desulphurizing of the material, and that its chief advantage, as compared with the older briquetting and roasting precesses, arises from the fact that the rotary kiln is an extremely effective labor-saving device.

STANDARDIZATION.

The Institution of Mining and Metallurgy

Salisbury House, London, E.C.,

November 4th, 1907.

Standardization.

Dear Sir,—

The circular embodying a number of questions on the recommendations of the "Weights and Measures" and "Mesh" Standardization Committees, sent to members of the Institution and other on February 11th, 1907, has elicited answers from technical societies and chambers of mines, as also from 280 engineers and metallurgists; and these answers have very strongly confirmed the conclusions of the Standardization Committeees.

As regards the general adoption of the metric system of weights and measures, opinions are so evenly divided that the Council do not feel justified in recommending uniformity of practice at the present time.

Whilst there is a very general feeling amonst engineers that the term "slimes" should be more clearly defined than at present, the suggestions received have been too divergent to justify the Council in making any recommendations on the subject at present.

I enclose copies of memoranda embodying the standards and definitions now adopted by the Council, and I am directed to express the hope that all members of the Institution, and other professional men, will adopt and use them in reports, scientific papers and other publications.

In some replies containing objections to the convenient constant of 85s. for the value of one ounce of fine

gold, the writers overlooked the fact that clause (6) in the accompanying memorandum refers only to assay results of ores, etc.; and it will be admitted that unavoidable variations in both check assays and check samples are such as to make the difference of 0.55 of a penny, per ounce of fine gold, a negligible quantity.

With a view to securing the greatest uniformity in the drawing of the wire and the manufacture of the standard screens, Messrs. N. Greening & Sons, Limited, of Warrington, England, have agreed to manufacture a certain quantity of each of the standard sizes to a width of 8 inches at one operation, and these will be supplied by them direct, by their agents abroad, or by dealers in laboratory supplies.

Note.—Sizes 5, 8, 10, 12, 16, 20, 30, 40 and 50 are now ready in 8 inch squares, and may be obtained in made-up "nests" by the end of November. The manufacture of the remaining sizes is being pressed forward with the least possible delay.

I am, dear sir, yours faithfully,

C. McDermid, Secretary.

Standardization.

Weights and Measures.

The following definitions have been adopted by the Institution:—

(1) The word "ton" shall represent a weight of 2,000 lb. avoirdupois (29,166.6 oz. troy).

[Note.—It is advisable to abandon the use of the terms hundredweights and quarters, and to express fractions of a ton in pounds or in decimals of a ton.]

(2) The term "miners' inch" shall represent a flow of 1.5 cub. ft. of water per minute; and the term "sluice head" shall represent a flow of 60 cub. ft. of water per minute.

[Note.—It is advisable to abandon the use of both terms, as being merely of local usage, in favor of definite expression of the flow of water per minute, or per second, in cub. ft. or in gallons.]

(3) The word "gallon" shall represent the Imperial gallon measure of 10 lb. of water.

(4) Temperatures shall be expressed in degrees centigrade.

(5) Returns of gold and silver shall be expressed in terms of fine gold and fine silver respectively, not as "bullion."

(6) Gold contents of ores, etc., determined by assay, shall be expressed in money values as well as in weights; and in this connection the value shall be taken (as a convenient constant) at 85 shillings, or $20.67 U. S. currency, per troy ounce of fine gold.

By order of the Council,

C. McDermid, Secretary.

Salisbury House, London, E.C., November 4th, 1907.

[Editor's Note.—The sluice head may more conveniently be taken as equal to 40 miners' inches, or one second-foot.]

Standardization.

Mesh or Wire Cloth.

The following table of "I. M. M. Standard Laboratory Screens" is intended for use in making grading tests and for the correlation of screens used in commercial or other work.

When screens other than the I. M. M. Standards are employed, the diameters of apertures should be given in any published results, so that comparisons may be made.

When screens are described simply by the number of meshes per linear inch, it will be understood that the I. M. M. Standard is referred to.

The number of sizes standardized has been reduced to a minimum, as it is desirable to abandon excessive refinements in grading tests. It is believed that the I. M. M. Standards will meet all necessary requirements of the laboratory.

In reporting grading tests it is desirable to state whether wet or dry screening has been employed.

Table.—I. M. M. Standard Laboratory Screens.

Mesh or apertures per linear inch	Diameter of Wire.		Aperture.		Screening area.
	in.	mm.	in.	mm.	Per cent.
5	0.1	2.540	0.1	2.540	25.00
8	0.063	1.600	0.062	1,574	24.60
10	0.05	1.270	0.01	0.254	25.00
12	0.0417	1.059	0.0083	0.211	24.80
16	0.0313	0.795	0.0071	0.180	24.70
20	0.025	0.635	0.0052	0.157	24.60
30	0.0167	0.424	0.0055	0.139	24.50
40	0.0125	0.317	0.005	0.127	25.00
50	0.01	0.254	0.0042	0.107	25.40
60	0.0083	0.211	0.0033	0.084	24.50
70	0.0071	0.180	0.0025	0.063	25.00
80	0.0063	0.160	0.05	1.270	25.00
90	0.0055	0.139	0.0416	1.056	24.92
100	0.005	0.127	0.0312	0.792	24.92
120	0.0041	0.104	0.025	0.635	25.00
150	0.0033	0.084	0.0166	0.421	24.80
200	0.0025	0.063	0.0125	0.317	25.00

Note.—Whilst absolute accuracy to the fourth place of decimals of an inch is impracticable in the manufacture of wire cloth, a sufficiently close approximation to the above standards is attainable.

The adoption of a screening area of 25 per cent. necessitating equality of size of wire and aperture, secures perfect interlocking and consequent permanence of aperture.

Some of the finer mesh screens can only be woven in what is known as "twilled."

By order of the Council,

C. McDermid, Secretary.

Salisbury House, London, E.C., November 4th, 1907.

WHERE MOOSE MOUNTAIN ORE WILL BE HANDLED

Key Harbor, Ontario. — A notable step in the development of Canada will be accomplished next spring when Key Harbor, on the north shore of Key Inlet, will be a busy port. Everything is in shape here to continue, after the freeze-up, the building of the ore docks, which are to be the foundation of



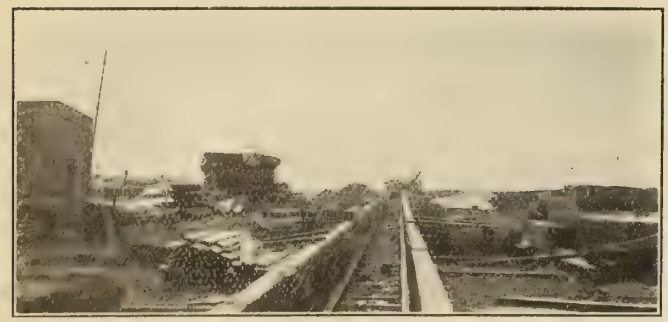
Power-house Tunnel for Ore Belt and Dock Piling, showing commencement of elevation through which steamer will be loaded.

the port, and from which the product of the Moose Mountain mines will be shipped to Cleveland and other American ports. The mines, thirty miles north of Sudbury, are already piling up ore for shipment as soon as the Canadian Northern Ontario Railway is able to carry it.

The strong position of the Moose Mountain ore, owing to its high percentage of iron, is improved by the location of the mines. They are about the same distance from navigable water as the iron ranges back of Duluth, but are over five hundred miles nearer coal and smelters than Duluth will ever be.

The Government steamer "Bayfield" has about completed the survey work for the harbor and its approaches. The entrance from Georgian Bay will be quite simple, only four ranges for the guidance of vessels being necessary, the last running straight into the dock. The buoys and lights are ready to be placed in position.

The six miles grading from the main line of the Canadian Northern Ontario Railway, three miles south of French River, is almost completed, and the building at this end of a mile-long trestle will be begun immed-



Tunnel through which 42-inch belt will convey ore to docks at rate of 800 tons per hour.

iately, on which train-loads of ore will be elevated so that their contents may be dumped into pockets and transferred to a rubber belt conveyor running through a tunnel cut out of the rock, and then elevated on another belt to a trestle sixty feet above water level, where it will be held ready to be shot into the steamers lying alongside. The capacity of the dock plant will be 8,000 tons per day of ten hours. The power-house is almost finished. Coal docks must also be built, and the tran-shipment of mineral alone must make Key Harbor a port of considerable magnitude within a short time; and immediately the Canadian Northern connection with Ottawa is completed it will be the entrepot for all Canadian Northern direct traffic between tide water and the West.

At the dockside there is 24 feet of water—more than sufficient to carry the largest boats on the lakes, for the draught of the Soo Canal and the St. Clair River is only 20 feet, 6 inches. Key Harbor will markedly affect business with Port Arthur. The biggest vessels will be able to bring wheat here from Port Arthur; carry ore to Cleveland, and load coal there for Port Arthur and the West. No such economical transportation is at present possible in Canadian services on the great lakes.

The whole of the construction is in charge of Mr. R. M. Pratt, who built the elevators and coal docks at Port Arthur, and has had great experience in railroad and terminal construction for a quarter of a century.



Eight-foot cribbing alongside Ore Tunnel. Government Survey Steamer, "Bayfield," and Ice Breaker alongside natural wharf of rock.

LIGHTING CONDUCTORS AND THE STORAGE OF EXPLOSIVES.

This is a subject into which the State Electrician of Western Australia appears to have gone thoroughly. In his official report that officer recommends enclosing the magazine building in what is practically a metallic cage. This can be done by erecting three poles, one at the back and two at the front. For larger magazines four poles, one at each corner, would be better. The poles should be about four feet higher than the building, and iron barbed wire should be stretched from pole to pole across the building. The barbed wire should be connected to stray iron wires from the top of the poles to earth plates sunk in the ground. The metal work of the building should be connected to stray wires also.

The system should be modified to suit various building and dry soils.

MONAZITE AND ZIRCON.

(Advance chapter from "Mineral Resources of the United States," 1896.)

By Douglas B. Sterrett.

(*Continued from last issue.*)

The product from the mill runs between 90 and 95 per cent. monazite. A higher grade product can be obtained by careful treatment, but is not necessary. The company works the stream gravels on its property with sluice boxes and treats the concentrates obtained on one of the Wilfley tables, bringing it up to nearly 90 per cent. monazite.

Ore deposit.—At the time of vist the ore rock was being mined from a shallow open quarry over 150 yards long in a northerly direction and from 8 to 25 yards wide. The cut varied from 5 to 20 feet in depth and was irregular in shape. The rock was generally removed through the full height of the working face and the ore material was cobbed out. This was not usually difficult, as the ore rock differed in appearance from the lean. The rock was somewhat jointed and, being partly weathered, was easily removed with the aid of dynamite. The ore was hauled in tram cars, drawn by horses or mules, from the quarry to the mill at the southeast corner of the cut.

Monazite was found in all of the rock taken from the cut, though the material used for ore occurred in bands varying from a few inches to 3 or more feet in thickness, interbedded with lower grade material. In places two or more streaks were worked for ore at the same time. All rock carrying above 0.4 or 0.5 per cent. monazite was treated as ore; beds carrying a lower percentage were discarded. Mill tests made on some of the lean streaks showed only 0.03. per cent. monazite.

Geology.—The country rock is Carolina gneiss, which has been considerably altered along certain strata by pegmatization. The beds have been thrown into a series of gentle folds. The latter, as exposed in the quarry, were from 20 to 50 or more feet axis to axis. The rock as a whole is a pegmatized graphite biotite gneiss, in which certain beds have been more highly re-crystallized or pegmatized than others. The beds carrying larger percentages of monazite are those with a typical augen structure. The latter is due to porphyritic feldspar crystals, and small bodies of pegmatite, ranging from the size of a grain of wheat to that of a walnut, scattered through the gneiss. Beds where pegmatization had been small, or where nearly the whole rock has been replaced by pegmatite, do not carry as much monazite as those in an intermediate position.

Under the miscroscope sections cut from specimens from one of the ore streaks show quartz, feldspar, biotite, graphite, muscovite, monazite, limonite in films and stains, and very little zircon. Though the feldspar has been partially kaolinized and was mostly lost during the grinding of the sections, it seems to be chiefly orthoclase and microcline; but a few small fragments of albite are left in one of the sections. The greater part of the quartz is plainly secondary. It occurs in bands or streaks of grains running with the schistosity of the rock. In some places the quartz has been deposited in the fractures or between grains of other mineral, while in other places it includes fragments of such minerals as biotite and graphite. Inclusions of gas cavities and some very fine acicular mineral, probably rutile, are not uncommon in the quartz. Biotite occurs in interwoven laths and crystals roughly parallel with the banding of the rock. The pleochroism of the biotite is light yellow-brown to dark greenish-brown. The graphite occurs as plates and laths, in general lying parallel to the banding of the rock, and exhibiting various relations to the associated minerals. In some cases it is interbanded with, and even interleaved with, biotite, while in others the plates were turned across the schistosity. Monazite occurs in contact with the various minerals of the sections, though it is more often included in or surrounded by grains of quartz and biotite.

The rock has been so thoroughly re-crystallized that it is impossible to say just what the original minerals were. The quartz was evidently the last mineral to be added, and the biotite was probably the first to be formed during re-crystallization. Much of the graphite was apparently contemporaneous with the biotite; the remainder was plainly formed later. It would be difficult to give the order of formation of the muscovite, feldspar, and monazite. They are intermediate between the biotite and the quartz, or in some cases probably contemporaneous with the latter.

Western States of the United States.

The investigations carried on by the concentrating plant of the United States Geological Survey at Portland, Orog., during 1905 and 1906[4] have shown the wide occurrence of monazite in the Western States. Appreciable quantities of monazite were found in samples from gravel deposits of California, Colorado, Idaho, Indiana, Montana, Nevada, New Mexico, Oregon, South Dakota, Texas, Utah, Washington and Wyoming. In many cases it would seem that workable deposits exist, judging from the percentage of monazite recorded in the tests. In Idaho especially there have been a number of monazite-bearing deposits recorded in the following counties: Ada, Boise, Idaho, Lemhi, Lincoln, Nez Perce, Owyhee, Shoshone and Washington. In practically every case where monazite was found there was considerable zircon present. When it is remembered that many of the western deposits on which tests have been made carry gold and platinum it will be seen that they should be paying propositions if carefully handled.

Idaho.

Several years ago Mr. Waldemar Lindgren, of the Geological Survey, called attention to the occurrence of a notable mass of monazite in the granite areas of the Boise Basin.

In 1906 investigations showed that the black sand residues left in the sluice boxes of the placer mines in the Boise Basin contained much monazite, frequently 50 to 200 pounds to a ton of concentrates. Similar investigations established the fact that the old tailing dumps left by previous placer miners were also rich in this material. When the original sand, including sand down Grimes Creek, was washed out for gold there were left in the residue the heavier minerals, especially monazite, in much greater proportionate quantity than in the original sand.

Publications of the Geological Survey calling attention to these considerable quantities of monazite in the Boise Basin led to the formation of the Centerville Mine and Milling Company, at Centerville, Idaho, for the

purpose of extracting monazite from the old placer workings. Machinery was installed, and two or three tons of monazite were collected by the time severe weather set in in November, 1906. Now, in the spring of 1907, additional machinery for the magnetic separation of the monazite from the concentration of the tailings on a Wilfley table has been ordered, and much monazite is being gathered by sluicing the old placer claims preliminary to cleaning up on tables.

Foreign Sources.

Brazil.

The principal source of supply of monazite for the world's consumption has been Brazil. In the United States, however, the market for the monazite has not only practically been supplied by the home production, but during the last several years a considerable amount of high-grade sand has been exported. In return, however, there is a large importation of manufactured thorium nitrate each year.

The Brazilian deposits lie along the coasts of the States of Bahia and Espirito Santo. The monazite occurs in the sand banks and dunes on the beaches, where it has undergone partial concentration by the action of the tides and waves. Gravel deposits of commercial value have also been reported along the Rivê Parahyba, where a plant has been erected to test their value. The exploitation of the Brazilian beach deposits was first undertaken by John Gordon, an American. In the early days of mining Gordon shipped monazite sand as ballast at a cost of less than $15 per ton, to Hamburg, Germany, where he realized large profits on it, since the lowest price at that time for sand carrying 5 per cent. of thoria was $95 to $120 per ton. Later he was forced to enter an agreement with the German combination of thorium manufacturers without being able to establish the intended monopoly of the export of Brazilian monazite. In 1903 the Barzilian legislative assembly decided that the deposits of monazite sand along the coast belonged to the Federal Government and forbade their exploitation. Later bids were let for the privilege of working these sands, and the rights were finally secured by A. C. De Freytas Company, of Hamburg. This company guaranteed a royalty of 50 per cent. of the sales made and an annual production of 1,700 tons. The De Freytas Company soon went into partnership with Gordon, and together the made an agreement to sell their whole product to the German thorium syndicate. From the latter they were to receive, in addition to the selling price, a share of the profits from the sale of thorium nitrate. In this way the thorium syndicate has held a partial monopoly over the production of monazite from Brazil.

When it was found that other manufacturers of thorium products were able to obtain supplies elsewhere and that the whole output of Brazil could not be controlled, the German thorium syndicate decided to kill out all competition. Accordingly, in January, 1906, the price of thorium nitrate was reduced to nearly half of that prevailing at the time. The quantity of nitrate sold to each consumer was limited to his demands and was so placed as to conflict with the attempted sales of companies not in the thorium syndicate. In this way the aquisitions by brokers of large quantities of low-priced thorium nitrate for speculative purposes was avoided. This cut in the price of nitrate has been injurious or fatal to several smaller manufacturers of thorium products who had supplies of high-priced material in stock, though it has not seriously affected larger well-established firms mining their own monazite. The effect on the production of monazite in the United States has been very small, and it is doubtful whether the total output was in reality less than in 1905. The production all came from North Carolina and South Carolina, and represents the output of five companies, with a few independent producers. Three of the smaller companies, once active in the region, have either been forced out of business or handled no sand during 1906.

As reported by Consul-General G. E. Anderson,[5] the exports of monazite in 1906 were 4,787 tons, valued at $480,843, as compared with 4,881 short tons, valued at $485,184 in 1905.

The federal authorities of Brazil continue to charge 50 per cent. on exports of monazite, and the quality of the sand obtained is not so good as formerly. Exporters state that they can not ship their monazite to the United States, since the tariff of 6 cents per pound for 5 per cent. thorium constituent is prohibitory.

Africa.

The monazite deposits of the Oban Hills and of Kukuruku Hill of Southern Nigeria,[6] Africa, were still further investigated during 1905. So far the Oban Hills have yielded the richest samples.

Russia.

In Russia the discovery of rich deposits[7] of thorium-bearing mineral has lately been reported in an abandoned mine in the province of Perm.

Malay States.

The occurrence of monazite with alluvial tin ore has been reported at Pahang in the Malay States.[8] A sample of the tin concentrate contained about 13 per cent. monazite with a content of 8.38 per cent. thoria. This monazite does not much resemble the sand from the Carolinas and Brazil, since the grains are of an opaque whitish color. It should pay to separate this monazite magnetically before the tin ore is smelted, for the thoria content is unusually high.

South Australia.

A recent report in the (London) Mining Journal[9] tells of the finding of monazite in South Australia, on Kangaroo Island, about 30 miles from Kingscote. This discovery has not been authenticated as yet.

Ceylon.

During 1905 there was considerable prospecting for thorianite in Ceylon,[10] resulting in the finding of numerous small deposits and an of 17,900 pounds, valued at $24,110. Thorianite is a new mineral, discovered in 1904 in Ceylon. It carries from 70 to 80 per cent. of thoria, and has a specific gravity between 9 and 10. Thorianite has been discovered in almost microscopic crystals in the sands of various rivers and is found to be widespread occurrence in Ceylon. The matrix has not yet been discovered, though the pegmatites, cutting the acid leptynites of the region, have been suggested as the possible source. Besides thorianite and thorite, monazite has been discovered in the river gravels of Ceylon. In some places gold is found with these thorium-bearing minerals, and it seems the deposits could be profitably worked with mechanical separators for their several valuable minerals. According to Consul William Morey,[11] of Colombo, the exports of thorianite during the first three months of 1906 showed a falling off, for only 1,110 pounds, valued at $2,525, were shipped. About 100 pounds of thorite, valued at $97 were shipped in 1905.

Zircon.

The demand for zircon has not been large, and has generally been met in the United States by the intermittent working of the Jones and other mines near Zirconia, Henderson County, N. C. At these places the zircon is found in bodies of pegmatite out cropping along the top of a hill for a distance of over a mile. The zircon occurs in simple tetragonal crystals of small size, up to one-half inch square and 1 inch in length. There are a number of associated minerals, among which are many of those carrying rare earths, as xanthitane in abundance, with some titanite, titaniferous garnet, polycrase, allanite, auerlite, monazite, xenotime and cyrtolite. other minerals are orthoclase in crystals, epidote, staurolite, stilbite, magnetite, apatite, quartz and decomposed hydrated mica. The formations are badly weathered and are readily excavated through the shallow depths of most of the workings. The zircon is separated from the decomposed matrix without much difficulty by rough crushing and washing.

As already mentioned, zircon, in small, clear crystals can be obtained in quantity as a by-product from much of the monazite concentrates. A clean separation can be made with electrical machinery and by careful washing. With this object in view the concentrating plant of the United States Geological Survey at Chapel Hill, N. C., is at present engaged in making careful tests as to the best method of separating zircon, garnet, and other products of commercial value from monazite concentrates.

The output of zircon in 1906, amounted to about 1,100 pounds, valued at $248, and it all came from Henderson County, N. C. There was a call for several tons of zircon during the last part of 1906, but a supply could not be obtained before the close of the year. This demand has increased, and zircon is being mined during the present year as fast as possible to fill orders.

Production.

The production of crude monazite sand in the United States during 1906, amounted to about 2,000,000 pounds, which averaged about 30 per cent. monazite. Of this quantity North Carolina contributed about five-sixth and South Carolina furnished the remainder. The grade of this was so variable and the prices realized on different lots were so irregular that it has been found safer to estimate the quantity of monazite produced as concentrates. This is especially true since the greater part of the output is cleaned by local mills in the region before shipping to the manufacturers and the grade is brought up to at least 80 per cent. monazite. Estimating the quantity and value of all the sand produced in 1906 on an 80 per cent. basis, the production was: North Carolina, 697,275 pounds, valued at $125.510; South Carolina, 148,900 pounds, valued at $26,802—at total of 846,175 pounds, valued at $152,312.

The following table gives the production and value of monazite from 1893 to 1902, inclusive; of monazite and zircon in 1903; of monazite, zircon, gadolinite and columbite in 1904; of monazite, zircon and columbite in 1905; and monazite and zircon in 1906:

Production, in pounds, of monazite in the United States, 1893—1906.

Year.	Quantity.	Value.
1893	130,000	$ 7,600
1894	546,855	36,193
1895	1,573,000	137,150
1896	30,000	1,500
1897	44,000	1,980
1898	250,776	13,542
1899	350,000	20,000
1900	908,000	48,805
1901	748,736	59,262
1902	802,060	64,160
1903	[1]865,000	65,200
1904	[2]715,999	85,038
1905	[3]1,352,418	163,908
1906	[4]847,275	152,560

[1]Including 3,000 pounds of zircon, valued at $570.

[2]Including the small production of zircon, gadolinite, and columbite.

[3]Including a small quantity of zircon and columbite.

[4]Including 1,100 pounds of zircon, valued at $248.

The greater quantity of monazite sand recorder for 1905, as compared with 1906, without a corresponding excess of value, is due to the fact that in 1905, the quantity represents in part concentrates and in part crude sand, while the production for 1906 is placed on the basis of concentrates.

Imports and Exports of Monazite.

According to the Bureau of Statistics, of the Department of Commerce and Labor, there were no imports of monazite or other thorium-bearing minerals into the United States during 1906. A considerable quantity of thorium nitrate, however, has been imported during the last five years. The quantity and value of thes imports are given in the following table:

Year.	Quantity.	Value.
1902	42,815	$131,350
1903	64,520	232,155
1904	58,655	232,155
1904	58,655	249,904
1905	52,378	269,504
1906	40,000	139,929

Considerable monazite was exported to Germany and England in 1906. This was high-grade sand in each case, and amounted to from one-fourth to one-third of the output of the United States.

Prices.

The price of thorium nitrate has shown some remarkable variations during the last thirteen years, as appears in the following table:[12]

Prices (per kilogram of 2,2046 pounds) of thorium nitrate, 1954-1906.

Early in 1894	$476.00
January, 1895	214.00
July, 1895	119.00
November, 1895	71.40
May, 1896	35.70
October, 1896	21.40
October, 1899	7.14
Later, and in 1905	12.61
January, 1906	6.43

The prices paid for crude monazite in the North Carolina and South Carolina mining regions varied from 1½ cents per pound for very low-grade concentrates

with small thoria content to 15 or more cents for the better grades. The average price was nearly 8 cents per pound.

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[6](London) Min. Jour., December 29, 1906.

[7]New York Globe, April 27, 1907.

[8]Eng. Min. Jour., November 17, 1906, from Selangor Govt. Gazette, September 14, 1906.

[9](London) Min. Jour., March 30, 1907.

[10]Administration Reports, 1905, Min. Survey of Ceylon, pp. E 6 and 7.

[11]Daily Cons. Repts., No. 2598, June 25, 1906.

[12]Southern Industrial and Lumber Review, September, 1906.

COAL CUTTING BY MACHINERY.

(Science and Art of Mining.)

Last year coal was raised from 3,295 mines in Great Britain, as against 3,461 in 1902, and the number of machines at work was 1,136, as against 483, a clear gain during the period of 653 cutters. From this it will be apparent that machines are rapidly growing in favor, a considerable proportion of the increase being recorded in the East and West of Scotland, Yorkshire, the Midlands and Durham. The driving or motive power continues to be a debatable point. In Scotland electricity is chiefly in favor, 171 machines being so driven as against 134 by compressed air, and from the inspector's reports it is ascertainable that every year electricity is making headway most rapidly across the Border. On the other hand, in the Newcastle and Durham districts combined, which are nearest to Scotland, compressed air is the power for 140 machines, as against 79 driven by electricity. Again, there is an almost similar proportion —158 to 94—in Yorkshire, whilst in Lancashire (Manchester and Liverpool districts) the disparity is most pronounced, being 146 driven by compressed air to 14 only by electricity. In explanation Mr. H. Hall, His Majesty's inspector, says that machines driven by electricity are found to be less reliable than those actuated by compressed air. In the Midland district the position is curiously even, 70 machines by the one power and 70 machines by the other being the exact record. The total coal production of the United Kingdom last year was in excess of 251 million tons; in 1902 the output was about 227 1-2 million tons. The machine-mined coal in 1906 was 10,202,506 tons, and in 1902, it was only 4,161,202 tons. A simple calculation shows that though the experimental stage has been passed the production per coal cutter has but slightly increased from 8,615 to 8,981 tons. The increase in the number of machines and the total output therefrom is therefore more significant than the amount of coal obtained by each machine, the reason probably being that a great many machines were started too late in 1906 to affect the output appreciably. A broader view of the question of coal cutting machinery is now being taken, and the usual apology of which we heard so much ten years ago, that the miners objected to the use of the machine even under favorable conditions, has not the same force today. It is satisfactory to note that whereas in 1902 only one ton in about fifty was machine-mined, last year the proportion was one in twenty-five.

EXCHANGES.

The Dusseldorf correspondent of the *Iron and Coal Trades Review*, November 15th, remarks that a large reduction in the German coal output per miner has recently been noticeable. The miners' unions are mentioned as a possible cause of this. The iron and steel market is developing unfavorable symptoms. The expected increase in the export trade of the United States is influencing the German market appreciably.

The Ottawa correspondent of the London *Mining Journal*, whose letter dated October 22nd appears in the issue of November 2nd, does not observe that nice distinction between fact and fancy that is at least desirable in mining correspondence. In a Larder Lake item he states that the "long winter in this region has begun." This is incorrect. The canoe route to Larder City was open until October 28th. On November 1st the weather was mild and there was no sign of snow. On the succeeding day rain fell. Another item gives favorable mention to the Crawford property, which is thirty miles or more from Larder district. The boldest man should hold his breath for a long time before speaking commendingly of the Crawford mine. Our venerable English contemporary should appoint a Canadian censor. Canada's climate has been sufficiently misrepresented. Also it would be well for our London namesake to see that it does not lend its columns to very doubtful promotions. The letter referred to gives prominence to more than one wild cat. "The oldest, most influential and most widely circulated journal" must walk more circumspectly. Verbum sap.

The *Engineering and Mining Journal*, November 16th, contains an instructive editorial on the lead market. The depressed condition of this market had induced the American Smelting & Refining Company to curtail production. But the largest independent producers have refused to follow suit. The stocks of refined metal have increased to the large total of 30,000 tons, despite the efforts of the trust. "It has been fully recognized that . . . the apparently successful regulation of the price of lead," our contemporary adds, "by the American Smelting & Refining Company was based on a generally rising market; and that the test of its control would develop on a falling market."

The *Iron and Coal Trades Review,* November 8th, reviews in an editorial the steel trade position and prospects. Referring to the United States, it points out that, since 1904, so great has been the demand for pig iron that blast furnaces have been run with only a minimum of repairs. Now that prices have dropped it is fully probable that many furnaces must be put out of commission. Moreover, after a long campaign the relining of many stacks is imperative. These and like reasons indicate that the output of pig iron predicted for the States for 1908—30,000,000 tons— is excessive. Hence the danger of dumping is minimized by these considerations. "The world's appetite for iron and steel is growing and not shrinking, and Great Britain is by no means yet played out as an iron-producing and steel-manufacturing country."

In the *Engineering Magazine,* November, A. Selwyn-Brown writes on the world's tin mining industries. The

limited and almost stationary annual output of tin ore and the gradually increasing value of the metal have brought about many economics and inventions in tinning processes. Nowadays very little tin is wasted. There is not now an important tin-producing mine in operation in any part of North America. Of Africa the same can be postulated. Cornwall and small districts in Spain and Saxony are responsible for Europe's output. Excluding Cornwall, the Malay Peninsula, Bolivia, and Australia are the most important tin mining countries. There is a lack of agreement in official estimates of the world's total output of tin. It is probably about 85,000 long tons per annum. Of this the Straits Settlements may be credited with at least 55,000 tons. Bolivia ranks second with 14,700 tons; Australia, 9,300, and England, 4,920. The Straits Trading Company, an English corporation, has a large tin smelter at Singapore, which reduces most of the tin mined in the Orient. Curiously, the shares are largely held by Chinese merchants. The exhaustion of the easily worked surface deposits and the scarcity of Chinese coolie labor tend to hold back the output. In Siam and in the Chinese provinces of Yunnan and Kwangsi large amounts of tin ore are mined. In Bolivia the most important deposits are situated at an altitude of 15,500 feet above sea level. The mines are worked at great disadvantage. Labor is scarce and unreliable. The ore occurs in porphyry veins traversing a series of clay schists. It contains between 3 and 10 per cent. metallic tin. In Tasmania is the greatest individual tin producer in the world—the Mount Bischoff mine at Waratah. It has paid $10,395,000 in dividends during the past thirty-four years. The proved tin fields of Australia are ample to supply the world's wants, and their slow developmest is due solely to the scarcity of capital.

At risk of being charged with impertinence to a senior, we wish to indicate once more to the *London Mining Journal* that its Canadian correspondent has missed his vocation. His proper and only calling is wool-gathering. A luminous paragraph appears in the Canadian letter of November 9th issue. "Grand Trunk Pacific officials, who have been on a tour of inspection, as far west as the coast, confirm the report of the discoveries of coal in this region." We respectfully suggest that the *London Mining Journal* should authorize its Ottawa correspondent to confirm the discovery of salt in the Atlantic.

PERSONAL AND GENERAL

Mr. George H. Gillespie, acting consulting engineer of the Trethewey mine was in Toronto on the 23rd November.

Mr. Robertson has resigned the superintendency of the Hub Colliery and will be succeeded by Mr. W. Wilson.

Mr. O. Frohnknecht, ore buyer of Frankfort and New York, is visiting Nelson and other Western mining centres.

Mr. James D. Hurd, the new manager of the Crow's Nest Pass Coal Company took up his duties on November 16th.

Mr. E. M. Sandilands, a resident of Sandon, B. C., for many years, has been appointed Government Agent for the Moresby Island mining district.

It is reported that Mr. J. R. Blackett has been offered and has accepted the post of comptroller for the North Atlantic Collieries Company, of Port Morien.

Messrs. H. H. Melville, vice-president, and H. M. Johnson, consulting engineer of the Dominion Copper Company, recently visited and inspected the company's mines and smelter in the Boundary district.

Mr. D. Davies, who for some years past has acted as comptroller of the Crow's Nest Pass Coal Company has resigned that position, and will be succeeded by Mr. A. Klauer, heretofore employed as chief clerk in the company's office at Fernie.

Mr. I. Patterson, president of the Nickel Copper Company of Ontario and of the Nickel Steel Company, of Canada, recently visited Sudbury on business in connection with the sale of properties in this district to the Booth and McFadden syndicate.

Mr. Geo. S. Waterlow, of London, England, a director of the Rossland-Slocan, (B. C.) Syndicate, owning the Snowshoe mine in the Boundary district and other properties in British Columbia, is in Montreal, where he will remain for a week or so before visiting the West.

The Dominion Coal Company has recently created new offices on its engineering staff. Thus Mr. R. J. Bell, formerly of Port Hood, has been appointed assistant district mechanical superintendent at No. 2 and No. 4; Mr. Maxwell of No. 9 and Mr. Connors of the international.

At the annual meeting of the Pathfinder Mining Company, held recently at Grand Forks, B.C., the following gentlemen were elected to offices: President, Mr. W. K. C. Manley; Vice-President, Mr. G. H. Rutherford; Secretary, Mr. R. F. Petrie; Directors, Dr. Kingston and Messrs. T. Newby and A. W. Fraser.

Mr. R. G. Drinnau, for four years general superintendent of the Crow's Nest Pass Coal Company's mines, has resigned that position to become general superintendent of the mines of the Pacific Coal Company at Hosmer. Before leaving he was presented with a silver service, a fur coat and a purse of gold.

The retirement of the Hon. George A. Cox from the presidency of the Crow's Nest Coal Company is announced. Senator Cox has served the company in the capacity of President for a period of ine years. He is succeeded by Mr. G. G. S. Lindsay, K.C., who from his connection with the company as general manager is exceptionally well qualified to assume the presidential duties. It is understood that Mr. James D. Hurd, of Duluth, a mining engineer of long experience, has accepted the appointment of general manager, while Mr. R. M. Young has been appointed secretary to the company.

Mr. John Hopp, who is largely identified with mining in the Cariboo district, is reported as having stated that hydraulicing operations in this district during the past season were exceptionally satisfactory, the yield having considerably exceeded that of 1906. Mr. Hopp also expressed the opinion, that ere long lode mining would become an important industry in Cariboo, the indications of the occurence of gold in quartz and also of rich copper ores being most favorable.

A further effort by the United States Government to discountenance wild-cat mining schemes is evidenced in the prosecutions iniated by the Post Office Department against the promoters of a New Mexico concern on the charge of using the mails to defraud. The prosecution resulted in the conviction of the accuser, who received severe sentences, and it is likely that other flagrant instances will be brought to the attention of the authorities to be dealt with in the same manner.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—With this week the St. Lawrence shipments will be rapidly approaching a close for this season, and it is to be feared that the shortage in shipments will be considerable. This shortage is due to one cause only, and that is a lessened rate of production per man. There has not been this Summer any real shortage of labor so far as the number of names on the colliery rolls, or the organization of the working forces of the mines is concerned, for this has been in excess of any former years. But for some reason or other the producing capacity of the miner has gone down, and to-day it takes more men to do a given amount of work, than it did say five years ago. This phenonema is not confined to Cape Breton, for it has been noted the world over. In a recent editorial in the "Iron Age," this matter was referred to, the writer saying that while employers of labor did not blazon this fact, yet in all their councils it came up for consideration, and was causing them more perplexity than any other distrubing factor in business circles at the present time. We do not care to attempt to explain this fact, but a fact it is, and one that must be recognized.

The Hub Mine is now clear of water, and it is expected that hoisting will recommence very shortly. The mine has been idle since the 14th of last December. This is the second time the mine has been pumped out.

The Fire Brigades from the various collieries competed on the night of the 16th for the Fergie Cup, a trophy that was donated by the Coal Company's superintendent of mines, and which has given rise to much emulation and rivalry among the different colliery teams. The trophy was won by the Hub team, after a keenly contested fight, that was watched by a most enthusiastic crowd of spectators and partisans. This kind of rivalry and sport is healthy and commendable and much praise is due to the Manager's Association, which had charge of the arrangements.

The local papers announced that Mr. Alexander Dick had resigned his position as general sales agent of the Dominion Coal Company. So far no confirmation of this statement has been forthcoming, and it has been received with very general scepticism.

The Coal Company's Rescue Station at No. 2 colliery is complete with the exception of the interior fittings. The instructor, Mr. James MacMahon has arrived from England, where he has for many years been connected with breathing apparatus work and drill. Before coming to Glace Bay Mr. MacMahon spent several weeks in Germany, where he visited the Draeger factory at Lubeck, and all the important Rescue Stations in Germany. After Mr. MacMahon has acquainted himself with the general layout of the Coal Company's mines, and has got the equipment into order, he will proceed to organize and train the corps in the use of the apparatus. There is every reason to suppose that this work will be taken up as enthusiastically as the fire brigade exercises, that at present are becoming so popular round the mines. It is also anticipated that a certain amount of ambulance and first aid work will grow up in connection with the Rescue Station, and some day it is hoped the Coal Company will have fire brigades, ambulance corps and rescue squads properly organized and affiliated and ready for the emergencies that may any time arise in the work of coal mining.

Work on the new developments at Victoria and on the railway is going along steadily, and if the present fine weather continues considerable progress will have been made by Christmas.

Coal finds are still being reported from Antigonish, and we understand Mr. A. C. Ross, M.P., has taken up large areas in the vicinity of the reported finds. Mr. Ross has some little reputation for shrewdness in this kind of thing, and there may be something in the reports. If Mr. Ross does not own valuable mineral areas it will not be for want of trying.

The Mining Schools inaugurated this session by the Nova Scotian Government are making good progress. At Glace Bay the work is in charge of Mr. John Macdonald, late chief surveyor of the Dominion Coal Company. Classes are being held in elementary subjects in English, in mechanical and plan drawing, in engineering and mining, and are being well attended. Similar schools are being held in Sydney and Sydney Mines, and the beginning so far augurs well for their continued sucess. As to the necessity of these schools, there can of course be no doubt.

NEW BRUNSWICK.

The Dominion Iron & Steel Company have succeeded in securing a lease of the iron ore deposits at Lepreaux, New Brunswick, and operations will be started at the earliest possible moment. Axel Auderberg, the Steel Company's expert engineer, was in St. John on Tuesday, November 19th, and left directly for Lepreaux.

This information was furnished by Mr. Peter Clinch, of St. John, N.B., who is associated with the New Brunswick Iron Company, from whom the lease already referred to was obtained. The Steel Company will pay Mr. Clinch's company twenty-five cents per ton for all ore mined by them from the Lepreaux holdings. The Government is to receive a royalty of five cents per ton.

Just how many men will be employed at the mines or when operations will be started is not as yet definitely known, and at the present time Mr. Clinch is only aware of the fact that the preliminary drilling is to be done by contract.

The deal was put through recently by C. V. Wetmore and, for the Province of New Brunswick, is a very important transaction. Future developments are awaited with interest and further particulars will be furnished in the next issue of The Canadian Mining Journal.

In respect of mineral wealth, New Brunswick is inferior to Nova Scotia, but it posesses some valuable ores and there is an abundance of excellent stone. Coal is found at many points in the southern portion of the Province and is being worked at Grand Lake and in two or three places in Kent County. The seams are thin, but close to the surface and easily reached. Albertite is found in Albert County. Bituminous shale is found along with petroleum. Petroleum wells are being operated in Westmoreland County. Iron is found in many parts of the Province and has been worked extensively in Carleton County. Copper ore exists in large quantities and has been worked in Westmoreland County. Deposits of nickel, antimony, galena, manganese and graphite are also to be found in New Brunswick.

The Province is abundantly supplied with limestone, the most valuable deposit being in St. John County. Gypsum is found in large quantities and is extensively quarried in Albert County. Large quantities of granite are also found in various parts of New Brunswick—at Hampstead, in the Nerepis valley, and near St. George, in Charlotte County. In certain localities marble is to be found. Freestone suitable for building purposes and for the manufacture of grindstones and millstones is also found in many parts of the Province. There is an abundance of slate and in most of the counties clay is to be found for the manufacture of bricks. Mineral springs are numerous, the principal ones being in King's County, where salt springs are also to be found. The latter are now being profitably operated.

The value of the mineral products of the Province of New Brunswick in the year 1900 is stated in the last census returns at $650,679, as will be seen from the following statistics:—

MINING IN NEW BRUNSWICK.—CENSUS OF 1901.

Classes of Products.	Value of Products.
Metallic ores and products	$100,000
Abrasive products	38,400
Fuel and light material	17,479
Structural materials of stone and clay	262,408
Miscellaneous products	232,392
	$650,679

The Drummond Mining Company of Montreal have secured a lease of rich iron mining areas in Gloucester County, New Brunswick, and will immediately take steps to develop the property. The deal was put through in Montreal early this month by Messrs. T. M. Burns, M.P.P., and William Hussey, of Bathurst, who hold the property under lease from the Government, and it is understood that they are to receive a sum in the vicinity of $80,000 for their interest.

Mr. Burns confirms the statement that the deal was put through at the Canadian metropolis. Their development by a strong company will mean much to the people of the county. Mr. Burns expressed the belief that as far as New Brunswick is concerned this is the most important mining deal ever consummated.

The property referred to is located near the Nepisiguit River, about eleven miles from Bathurst. The ore is very rich and heavy outcrops are visible. A recent test, made by an expert engineer, showed a depth of 320 feet of solid iron ore. It will, no doubt, take a great many years to exhaust the supply.

In order to properly develop the mines it will be necessary to construct a branch line of railway to connect with the I. C. R. at Bathurst. Mr. Burns has decided to have a delegation wait upon the Minister of Railways in the near future and apply for a subsidy. An application will also be made to the Provincial Government for assistance.

Fred. R. Taylor, of the law firm of Weldon and McLean, St. John, N.B., appeared before the Provincial Government at Fredericton on Tuesday evening, November 5th, for Col. Calhoun, of New York, of the Albertite, Oilite & Cannel Coal Company, asking the Government to settle the terms of a lease of shale deposits in Albert County.

The company offers to spend $100,000 in development in three years, and to pay $300 annual rental if they can secure a one hundred years' lease of the territory, which covers about 200 square miles. They propose to work things on a royalty basis of 10 cents per ton for shale and $1 per ton for Albertite. The principle of the lease was decided when Hon. A. T. Dunn was in the office of Surveyor-General, and the Government is to take the matter into consideration at an early date.

QUEBEC.

QUEBEC.—Many years ago alluvial gold was found in the valley of the Chaudiere River (Beauce County). About two million dollars worth of gold was taken out from the Gilbert River diggings. A great deal of prospecting has been done to discover gold quartz in place, but without success. Last summer, however, in the Township of Marston, near Lake Megantic, a farmer while ploughing struck a vein of quartz showing sights of gold. A mining license was taken out and this fall a small syndicate called "The Marboro Gold Mining Syndicate" was organized amongst local people. The occurrence may be described as a band of quartzite and quartz conglomerate interbedded between the stratification of the slate and intersected by numerous veinlets of quartz. Many of these veinlets contain visible gold. The dirt from drilling shows numerous coarse colors along with some fine colors. The reef itself has a width of seventeen feet. The prospect is a significant one. If the whole body is good for milling it will be the first commercially important gold-bearing quartz discovered in place in the Chaudiere River district. Prospecting will be renewed vigorously next summer.

The asbestos mines are in full operation, the market demand for their product continuing good. The district of Broughton is developed on a large scale for the treatment of fibrous serpentine. Three large mills are working. The last one to be started is owned by the Eastern Township Asbestos Company. Two more mills will be built there this winter by the Frontenac Asbestos Company and the Boston Asbestos Company.

The Chrome ore mines of Colraine are also in operation, and deep mining is being undertaken by the Black Lake Chrome & Asbestos Company.

The Ottawa mica district is working steadily. A fair price is still obtainable for small mica.

The Hull cement works is to increase largely its production.

Natural gas is being used for power purposes in the district of Three Rivers, as mentioned at length in the annual report of the Provincial Bureau of Mines.

ONTARIO.

COBALT.—The Copper Cliff smelter's change of arrangements in receiving ore is a topic of importance to producers of ores. The system heretofore has been to pay cash for ores in fifteen and forty-five days. In future twenty-five per cent. will be paid in forty-five days and the remaining seventy-five per cent. in ninety days. In place of a cheque payment will be made in silver bullion. Apart from friction and temporary inconvenience, this action, though drastic, will have the effect of steadying things and encouraging a larger production.

La Rose mine in the week ending November 23rd shipped twenty-two cars of ore. More than this could be shipped were the supply of cars sufficient.

On the Cobalt Central the concentrator is running steadily. A night shift is now working as well as a day shift.

The Cobalt Central has announced an offer of a $1,000 reward to any persons discovering a vein on its properties. It stipulates. however, that the vein must have been a silver content of at least 500 ounces to the ton.

The Silver Queen has reduced the number of its employees to eighteen. Drilling will be done on day shift only. Wages are being cut considerably.

ALBERTA.

FRANK.—The Canadian-American Coal & Coke Company, of Frank, Alta., and Wm. McVey, fire boss in the employment of the said company, were each fined for a contravention of the Coal Mines Act. It appears that the company had employed McVey as a fire boss, while McVey was not the holder of a fire boss certificate, as required by the mining laws of the Province.

BANKHEAD.—The briquetting plant installed a few months ago by the Bankhead Mines, Limited, which produces 300 tons of briquettes in 24 hours, is being duplicated, as the plant has proved such a success.

This company is also installing a new ventilating fan and boilers of the most approved type at their air shafts, which are driven out to the surface on the side of the mountain, where the coal outcrops.

COLEMAN.—Messrs. A. C. Flummerfelt and H. N. Galer, president and vice-president of the International Coal & Coke Com-

pany, of Coleman; of the Alberta Coal Company of Lundbreck, and the Royal Collieries of Lethbridge, have taken over the mines of the Breckenridge and Lundbreck Coal Company in connection with their other undertaking near Lundbreck, viz., the Alberta Coal Company. The Breckenridge and Lund mine has never been fully developed, but the new owners intend pushing forward development work with all speed. The coal to be produced is a domestic coal, which will be shipped east and sold in the prairie towns along the railway.

HILLCREST.—The Hillcrest Coal & Coke Company, Limited, which was fined $200 recently for locking out some of their miners in contravention of the Lemieux Act, has appealed the case, claiming that the text of the notices posted at the mines prior to closing down did not constitute a lockout. It is anticipated that the labor troubles at Hillcrest, which have been of long duration, are about to be settled, and while the final settlement is being adjusted the men are once more back to work and the mine running to its full capacity.

LETHBRIDGE.—Again the Lemieux Act, which by this time is known to every man, woman and child in our Western coal mining camps, has been brought to bear on a difference arising at Lethbridge between the Alberta Railway & Irrigation Company and their employees. The dispute in this case hinges on the very important point whether a pony driver's work in the mine commences at the time he starts to harness his horse or at the time he reaches his switch and commences to haul coal.

The company was represented on the Arbitration Board by Messrs. George Hatch and Hugh McBeth, the miners by Messrs. Fred. Hopkins and Thomas Biggs.

In the case of the Alberta Railway & Irrigation Company's mines, the face of the coal has advanced a long distance away from the bottom of the winding shafts, and in many instances the stables are situated a mile away from the working places, so that a considerable time elapses between the time the driver harnesses his horse and the time he reaches his appointed station to commence hauling coal. The men claim they ought to be paid from the time they leave the stables, while on the other hand the company claim the men's pay begins when they reach their working places.

President Hamilton of the miners' local union testified that where he worked in Indian Territory in a non-union mine, the pay started when the harnessing of the horses began.

DIAMOND CITY.—The Diamond Coal Company are opening a new mine on an extensive scale at Diamond City, which is in the Lethbridge district. At present this coal camp has no railway connection, but when the high level bridge on the C. P. R. is built they will have direct communication with the Crow's Nest branch.

The mines will be laid out to produce 1,000 tons per day of domestic coal. At present the machinery for the new plant is being hauled in from Leavings, a distance of 30 miles. Leavings is a station on the McLeod to Calgary branch of the C. P. R.

BRITISH COLUMBIA.

HOSMER.—A sad accident caused by an explosion of dynamite occurred at the Hosmer mines, whereby three miners, Harry Montelbetti, Joseph Lichazt and J. Matawish, lost their lives.

FERNIE.—At a meeting of the directors of the Crow's Nest Pass Coal Company Senator Cox resigned the presidency, his place being taken by G. G. S. Lindsay, K.C., who has been general manager for some time. Jas. D. Hurd, of Duluth, succeeds Lindsay in the general managership. G. G. S. Lindsay was at the same meeting advanced to the office vacated by the retirement of Geo. A. Cox, with the understanding that as chief executive officer he devotes all his time and attention to the duties of the position, and as this in turn involves the appointment of a new general manager, that office has been filled by the selection of James D. Hurd, a mining engineer of long experience. Mr. R. W. Young becomes secretary.

THE KOOTENAYS.—The dark shadow which has been hanging over this district for some time past settled on the Boundary country this week when the mines of the Granby, British Columbia Copper and Consolidated (Snowshoe) Companies ceased operation simultaneously, and the fires were gradually drawn from the Granby and other smelter furnaces.

Rumor has it that the Rossland mines and possibly other properties and industries related thereto will follow suit, but there has been no action taken at the time of this writing, and it is hoped that no such a situation will occur. It is argued, and with some logic, that while the Boundary mines are mostly low grade copper propositions, the Rossland properties, though still lower in copper, have a preponderance of gold, average ore running approximately one-half an ounce of gold ($10), which is naturally nt affected by present conditions; one ounce of silver (58 cents) and one per cent. or a little under of copper ($2.60). So it is anticipated that if supplies, etc., come down in price the mines on Red Mountain will be able to continue work and realize a good profit on their production.

Numerous elements have brought about the train of events that has culminated in this action by the Boundary mines. The cardinal point, of course, has been the big drop in the price of the metal they are mining, copper; then there has been an increase of from twenty to about forty per cent. in the cost of supplies of every kind for use in mining and smelting; increased cost of labor, etc. This condition of affairs could be tolerated to a greater or less extent with copper above twenty cents per pound, but when copper slumped and the other costs remained the same it placed the mining companies between Scylla and Charybdis. They chose what they considered the lesser evil and closed down, awaiting a more equitable adjustment of conditions.

It is felt that this phase of the present situation will not be of long duration, and that the mines will start up again in a month or so. At least we all hope that this will be the case. It is rumored that when work is begun again the wages offered will be on the old scale; that is, $3.50 for miners for eight hours' work, instead of $4 as they have lately been getting, and so on down the line. It will probably mean a reduction of about twenty per cent. in wages from what they have been getting here lately. Most of the miners do not object to this step backward, as it were, and it is not anticipated that there will be any friction caused by a move of this kind.

Many of the miners have taken advantage of the close-down to take long looked for holiday trips to the Old Country and to their homes in Eastern Canada and the United States. Owing to there being a superfluity of labor at coast points and other parts of the Province most of the miners are contenting themselves with staying in the Boundary district.

The Rossland mines have been shipping about the same quantity of ore as last reported. Development work is going on as usual, and the ore is showing up well. There are large quantities of ore in the Consolidated and Le Roi mines that have recently been blocked out, and the future looks bright for these mines if outside influences do not hold them in check.

Mr. Kiddie, the new manager of the Northport smelter, was in Rossland early this week, but had nothing to say in regard to smelter matters.

The cessation of ore shipments from the Snowshoe mine in the Boundary to the Trail smelter will probably cause the closing down of a couple of copper furnaces there.

Le Roi Company have ceased diamond drill work in the Spitzee, which property they have under bond in this camp. The company has not given out a report as to the success they had in their work on that property, but it can be taken for granted that it was not of a very brilliant nature, as the mine was examined

the other day by Mr. Alexandar Sharp, who is managing the First Thought mine near Orient, Wash., in the interest of the shareholders. Naturally Mr. Sharp was mum on the subject. Mr. Sharp is managing the First Thought mine for "Pat" Burns, the Calgary cattle man, who owns a controlling interest, and is making quite a success of the proposition.

Prior to closing down all of the Boundary properties were making record shipments, with the exception, of course, of the Dominion Copper Company, which had already closed down, and things were looking particularly well. For the week ended November 9th the Granby smelter made a new record, treating an average of over 3,200 tons of ore per 24 hours. Total shipments for that week from Boundary were as follows: From Granby mines, 22,080 tons; from Emma, 930 tons; Mother Lode, 3,397 tons; Snowshoe, 5,480 tons. The Snowshoe has been making very heavy shipments, reflecting credit on the assiduity of Superintendent Biesel.

Dominion Copper Company officials are expected in the Boundary at an early date. Warner Miller, president, New York; H. H. Melville, vice-president, Boston; M. M. Johnson, consulting engineer, Salt Lake, and probably some of the other officers will look over the situation on the ground. (Later—Melville and Johnson arrived at Boundary on November 13th and are looking over ground.) T. L. Dickason, of Chicago, president of the Crescent mine, is also expected at that property in the immediate future. This property is now equipped with a good electrically operated hoisting and compressor plant, and work will very likely be pushed forward earnestly from now on. The annual meeting of the Pathfinder Mining Company was held at Grand Forks early in the month. Officers were elected, and it was decided not to do any further development work on the property for the time being. A Grand Forks mineralogist discovered graphite within the city limits the other day, and a number of the citizens affected by the craze are having samples of the soil in their flower gardens tested.

The Spokane & British Columbia Railway, better known locally as "The Hot Air Line," which now runs trains from Grand Forks to Republic, Wash., is shortly to be built from the latter place to Spokane, Wash. This move should prove of much benefit to the Spokane & British Columbia, and will no doubt result in a much better position for this road in the railway world.

There is no doubt but that the Tulameen district as well as the Similkameen will be coming to the front in mining affairs in a very short time. Large ore deposits carrying tantalum, thorium and thallium have been located in the Champion Creek district.

A Denver outfit has put up $10,000 to prospect a platinum ore deposit near Slate Creek. Numbers of prospects are being worked in both of these districts and good strikes are reported daily.

Robt. Stevenson, of Princeton, is reported as going to develop a copper property on the Similkameen River this winter. If he makes as great a success of his mining as his namesake did with literature, that copper mine will surely turn out well.

Railway work was never more active in this district. Engineers are in the field making a survey of the proposed extension of the Nicola branch to Princeton. Good progress is being made on the V. V. & E. between Keremeos and Hedley. There is only a small force working on this, but it is expected that Hedley will be reached early in the spring. It is probable that a larger force will be put to work now that labor is a little more plentiful and the work hurried on. Nine feet of good bituminous coal have been located on the property of the Nicola Coal Company. There is not much doubt that when the Nicola coal fields have been developed to a greater extent valuable mines will be found there. Prospectors are cutting seams of coal right along in that country and things are looking better.

Travelling a little farther from home, another discovery of gold is reported from the vicinity of Cape Scott, Vancouver Island. Numerous claims have been staked, as usual. We hope that the find is of a substantial nature, and that its existence will not be of the same evanescent nature as other discoveries we have known. A number of the business men of this district are interested in the Telkwa and other northern mining fields. Travellers from the Telkwa country claim that the mines there are likely to equal if not surpass the Boundary propositions. If they do, then so much the better for British Columbia. Another proposition in the Tatlayoco Lake district attracting local attention is an antimony mine, carrying 67 per cent. antimony and some gold and silver, total values running approximately $209 per ton. There is also a quartz lead on the property running about $54 per ton in gold. A copper-bearing dyke on the claims varies from 75 to 200 feet in width, values averaging about $11 per ton. The property is in a development stage as yet. Of course "the north" is a big country, and we only hear of the richest of the mining properties, still some of the tales of wide and long ledges of rich copper and other ores that have been found and are being worked make a fellow feel like getting into his "diggin' clo'es" and "hiking" for the frontier.

The Alaska Treadwell Company treated 702,953 tons of $2.42 gold ore during the year ended June 1st, realizing $2.15 per ton. They paid 14 per cent. in dividends, or $700,000. They certainly have the art of ore extraction down pat at Treadwell, and can make very low grade ore pay, but it is naturally a much more amenable product than most of the mill men in this country have to struggle with.

The Arbitration Board in the Consolidated (St. Eugene) matter did not meet as expected owing to the bereavement of one of its members. Hence we cannot report the outcome of this question at this writing.

Robert R. Hedley, special commissioner, Department of Mines, Ottawa, is now in this country gathering data in reference to the Western mining industry. This is the proper way to secure reliable information. Much more can be done by a man on the ground in an hour than can be done through the mails in a month.

Slocan mines are steadily getting in supplies for the winter, and development work will be done on a number of properties all winter. The Westmount is about ready to ship a car of ore. The Reco mine is reported to have lots of ore in sight.

The Silver Dollar mine of Lardeau will ship a large quantity of concentrates now on hand as soon as the snow is in condition for "rawhiding." A Philadelphia company is doing some gold dredging at Gold Hill in the Lardeau near Poplar Creek, where the gold excitement was a few years ago. The outcome of the venture will be awaited with some interest by miners in this country.

Wm. Waldie, of the Queen mine, Salmo, in the Ymir district, has recently ordered an addition to his stamp mill. Mr. Waldie will yet make a good mine of the Queen. We must admire his pertinacity, which will no doubt achieve success in the end.

Work is proceeding as usual at the St. Eugene Mine, Moyie. A large force of men is being employed and the mine is looking well.

Chas. A Mackay, manager of the mine that is working in the middle of Moyie Lake, has his caisson shaft down about 80 feet and will begin pumping the water out of it at an early moment. The bottom of this shaft is now resting on 10 feet of clay. In a prospecting drill hole sunk on this property some time ago they got traces of galena ore from the bottom of the lake. If Manager Mackay gets the St. Eugene lead in the lake bottom the value of claims on the other side of the lake will be greatly enhanced.

The C. P. R. is reported as going to build that long looked for piece of railway from Golden to Fort Steel. Let us hope it is

so. This road would open up a very rich mining and agricultural country and would be a paying proposition all around. The C. P. R. Company has made extensive improvements at Cranbrook, which will aid them materially in handling the Crow-Spokane business.

One of the many mines that would be benefitted by the Golden-Fort Steel branch of the C. P. R. is the Giant mine near Golden, where they have recently installed an Elmore vacuum oil plant, with a capacity of forty tons a day. Other mines mines aided would be the Ptarmigan, Red Line, Paradise and others.

At a meeting of the shareholders of the Alberta Railway & Irrigation Company, held at London, November 7th, among other things the chairman reported that the common shares of the company would no doubt be placed on a dividend paying basis in 1907, which will be noted by the holders of such shares with much gratification.

As has been hinted for some time, a shuffle has occurred in the affairs of the Crow's Nest Pass Coal Company. Hon. Geo. A. Cox has retired from the presidency, and Mr. G .G. S. Lindsay, K.C., has stepped into his place. James D. Hurd, of Duluth, will be general manager, and R. M. Young will be the new secretary.

A banquet was tendered Mr. R. G. Drinnan at Fernie on the 14th November, prior to his departure for Hosmer, where he will shortly take charge. Mr. Drinnan is a very popular man on the Crow, which was duly manifested during the course of the dinner.

The coal mines have been busy, but it is expected that several of them will materially curtail their output or cease operation as far as coke and coal production for the Boundary is concerned.

GENERAL MINING NEWS

NOVA SCOTIA.

SPRINGHILL.—The miners of the Cumberland Coal & Railway Company have applied to the Department of Labor for a new conciliation board to investigate certain matters of difference between the men and the company.

The Springhill mines are now outputting about 1,400 tons of coal per day. Manager Cowans has hopes of catching up with back orders before the winter is over.

The mechanics employed by the Cumberland Coal & Railway Company quit work on October 2nd. This left the pumps and necessary power machinery of the mines unmanned. The officials of the company, however, came to the rescue and filled the vacancies. Men are to be sent by the Provincial Government to relieve the situation. Deputy Minister McKenzie King is now in Springhill.

HALIFAX.—Two hundred students are now in attendance at the Halifax Technical School. The movement for technical education is being enthusiastically supported by the people.

PORT MORIEN.—Thirteen square miles of coal areas adjoining the areas of the Cape Breton Coal, Iron & Railway Company (Broughton areas) are the subject of negotiations between the Dominion Steel and the Cumberland Railway & Coal Company. Three seams of good coal have been found on the areas.

SYDNEY.—Iis expected that the Dominion Coal Company will despatch the last coal-laden steamer up the St. Lawrence on or about November 23rd. Navigation usually closes about that time.

The Dominion Iron & Steel Company on November 18th made a new record by producing in 24 hours 1,086 tons of steel rails. A cargo of 4,050 tons of rails left Sydney yesterday by the Elder-Dempster liner Memnon for Quebec, to be used by the Transcontinental.

ONTARIO.

COBALT.—The McKinley-Darragh Mining Company has definitely reduced the wages of its employees. It is understood that there will be a general movement towards reduction of wages all over Cobalt. This is an inevitable effect of the present tightness of the money market.

Cobalt mining companies with head offices in the United States are being urged to establish transfer and registry offices in Toronto.

A movement is on foot in Cobalt to form a shareholders' protective association. By its aid rigid examination will be made of the administration of funds.

The Coniagas concentrator is handling between 60 and 70 tons of ore per day. The richest ore is first hand picked out. An extra Wilfley and a Wilfley slimer have been installed. The mine is employing a full force of 130 men.

The Buffalo mine has 120 men working regularly. .

The proposals of the Copper Cliff smelter have been thrown into definite shape thus: The right of sending back bullion instead of cheques is reserved; for ore carrying 4,000 ounces or over they agree to give the mine 94 per cent. of the value; 1,200 ounces, 93 per cent; 800 ounces, 92 per cent; 500 ounces, 90 per cent.; 300 ounces, 85 per cent.; and 150 ounces, 80 per cent. Ore containing 12 per cent. or over of cobalt will be paid for at $30 per ton; 8 per cent. cobalt, $20; and 6 per cent., $10. Within 45 days of the last day of sampling, the company promises to pay 50 per cent. of the amount due the mine, the balance being payable in ninety days.

PORT ARTHUR.—The first car load of silver ore shipped from the Beaver mine since reopening left Port Arthur recently. It was shipped to Omaha. A new mill will probably be erected.

The rumor that West End Silver Mountain mine was shut down has been officially denied.

BRITISH COLUMBIA.

ROSSLAND, B.C., Nov. 23.—Rossland Miners' Union held on November 25th a referendum vote for the purpose of determining whether or not the present scale of wages will be decreased to the scale which prevailed prior to July 1 of this year. The scale at that time provided for $3.50 a day for miners, instead of $4 as at present. Other workers around mines will have wages reduced in like proportion if the vote is in the affirmative.

The lower price of metals has cut down the profits of mines to such an extent that it is claimed they cannot be operated under the present scale and may close down if the scale of wages is not reduced.

The Granby Consolidated Mining, Smelting & Power Company wired from Grand Forks: Shut down is due to the low price of copper, the high operating costs and the united action amongst the large copper producers of America to curtail production and reduce the surplus of copper.

KASLO.—The market for zinc ores is improving. Recently the Whitewater mill sold 2,500 tons to a large Kansas reduction company. A contract was made for the entire output of the property for one year.

FERNIE.—Three men were killed by the explosion of a missed hole in an open cut at the Hosmer mines of the Pacific Coal Company. This is the first fatal accident to any of the company's employees in the district.

NICOLA VALLEY.—The Diamond Valley Iron & Coal Company is sinking a shaft to its principal seam. Three shifts are at work.

NANAIMO.—The Western Fuel Company broke all local records on Wednesday, November 6th, by hoisting 2,803 tons of coal from its No. 1 and Northfield mines. Of this amount the Northfield mine put out 1,238 tons.

CRANBROOK.—Three additional furnaces are to be installed at the smelter of the Sullivan mine, located at Marysville, B.C., as soon as financial arrangements are completed.

FAIRVIEW.—Work on the Canada Zinc Company's building and plant at Fairview is being rushed. It is hoped that everything will be in readiness to start in March. The electric reduction process, successfully operated in Sweden, has been materially modified and improved. If the plant proves a success the zinc-lead ores of Kootenay will at once go up in value.

VANCOUVER.—A syndicate of Vancouver and Victoria people is about to undertake the development of a group of seven copper-gold claims on Moresly Island. A plant, including a steam hoist, a twenty horse-power boiler and a Cameron steam sinking pump, will be shipped in the immediate future.

Reports have reached this city that the Cornell copper mine on Texada Island has been sold to G. L. Tanzer, a Seattle mining man. The Texada Consolidated Mines have acquired the Cornell from Mr. Tanzer, along with eight claims of the Raven Creek group. Two thousand feet of tunnelling have been done on the Cornell.

YUKON.

DAWSON.—Four hundred tons of dredge construction material must yet be received before the dredges of the Consolidated can be completed. There is now enough material on hand to complete two. Several million feet of lumber will be distributed from the company's sawmill at Twelve Mile. The old dredges on 104 and 90, Bonanza, were closed down on October 13th.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

Commenting on the fact that one of the largest British railway companies has recently placed an extensive order for open-hearth steel rails, the *London Times* remarks that this will not occasion surprise to those who have followed this method of the manufacture of steel. That greater reliance can be placed on the product of the open-hearth furnace is now fully attested by the almost complete exclusion of Bessemer steel for structural purposes, and the specification of open-hearth steel for use in bridges and other structures has become so familiar as to be generally understood when the specification is silent upon the method of manufacture required. While it is not anticipated that the Bessemer converter will be completely superseded by the open-hearth furnace, the number of new works in Great Britain equipped for the manufacture of steel by the open-hearth process greatly exceeds those planned for the Bessemer process, and the demand for the former material is enormous in view of the extensive employment of structural steel for skeleton framework of buildings and steel plate for ships, boilers and engineering work generally.

The death of Mr. Forster Brown, one of the best known engineers in South Wales, has occasioned sincere regret. As an expert his advice was much sought after, and his opinion highly valued. The deceased gentleman was associated with the opening up of some of the most important collieries in the South Wales district.

At a public meeting recently Mr. Samuel, Under Secretary for Home Affairs, spoke on the subject of the Mines Regulation Acts. As to the proposed Mines Department, he said the work had now to be dealt with by the officers of the Industrial Department, which he considered wrong. The country ought to have a real Mines Department, with a chief inspector of mines continually devising new improvements. He had no doubt that the Royal Commission on Accidents would recommend the creation of a Mines Department, and he hoped it would be the privilege of himself and Mr. Gladstone to carry out the scheme.

Mr. Arnold Lupton, M.P., has published a pamphlet of the Eight Hours Bill, in which he refers to the fact that in two large collieries started by him with eight hour shifts underground, the colliers in each case requested that the hours should be increased to nine. In one case the change had the immediate effect of increasing the average earnings to the extent of a shilling a day, and based on this evidence he thinks that the average decrease in earnings following the adoption of an eight hours bank-to-bank day would not be less than two shillings a day.

According to statistics compiled by a well-known British firm, the world's production of pig iron during 1906 was 58,742,322 tons, an increase of nearly five million tons on the output of 1905. In 1906 the United States manufactured 25,307,191 tons; Germany, 12,422,177 tons; and Great Britain, 10,149,388 tons.

GERMANY.

Extensive improvements are contemplated in connection with the Krupp collieries, Hanover and Hannibal, no less a sum than seven million marks having been appropriated for the thorough equipment of the mines.

AUSTRIA.

Advices from Budapest affirm that the State has decided to acquire a number of collieries and has already purchased large areas of coal-bearing lands, which have not been properly exploited up to the present time owing to lack of capital and means of communication. In addition a colliery has been purchased in Croatia which is already producing 100,000 tons.

FRANCE.

Some interesting figures have been published on the cost of coal production in the Nord. Thus while in 1887 the annual output per man was 306 tons, the average annual wage was £44 6s. 4d., and the cost per ton 3s. 6d.; in 1906, the annual output per man was 261 tons, the average wage £58 13s. 8d., and the cost per ton 5s. 8 1-2d. In fact during this period there has been a gradual but persistent decrease in output per man accompanied by a steady increase in wages paid and in cost of production.

SWEDEN.

A Consular report states that about 4,500,000 metric tons of iron ore were produced in Sweden last year, from 308 mines. The gold production was, however, very inconsiderable, while lead was produced to the amount of 7,000,000 kg.; copper, 1,209,130 kg.; and zinc, 174,600 kg.

RUSSIA.

Intelligence has been received of the discovery of rich gold placers near Okhotsk, and several enterprises are already prepared to work them. The discovery, it is stated, of gold in the north-eastern possessions of the United States, in Alaska and on the Seward Peninsula, has been of great importance in the development of adjacent Siberian territory.

PORTUGAL.

Portugal produces, according to an official report just issuel, antimony, arsenic, anthracite coal, copper, lead, iron, manganese, tungsten, tin and zinc. The industry, however, is not yet established on a very important footing, since the total mineral output for last year is valued at only $1,803,380.

UNITED STATES.

For the nine months ending September 30, asbestos to the value of $798,301 was imported into the United States, the product being that of the mines of Thetford and Black Lake districts, in the Province of Quebec.

Nearly all the copper mines in the United States, following the example of Butte, have announced a reduction in miners' wages. Among others the principal mines in Arizona, notably Bisbee, Globe, Clifton-Morenzi and Jerome, have effected reductions, as have also a number of the large companies operating in the Lake Superior mining districts. Thus the Calumet & Hecla has announced a reduction of 12 1-2 per cent. in the wages of all classes of labor at the mines and mills, while in other cases a reduction of only 5 per cent. has been made. The Calumet & Hecla employs between six and seven thousand men. The miners, however, are not permitting the new scale to go into effect without protest, and a deputation has been appointed to request the company to make the reduction less severe.

Meanwhile iron mining in this region is very active, production during October constituting a record for the year, the output from the five ranges being approximately 6,400,000 tons.

The Couer D'Alene lead mines still continue to maintain a normal production, despite the unsatisfactory lead prices, while last month five companies paid dividends aggregating $576,000.

As a result of lower treatment rates conceded by the mill and smelter trusts, a largely increased output was made by the Cripple Creek mines last month, or 69,950 tons, valued at $978,086, as compared with 62,950 tons, valued at $944,200, for September. It is anticipated that the November output will realize $1,250,000.

The mineral production of the United States is shown in "The Mineral Resources of the United States," advance sheets of which have been issued, to have reached the enormous total value of $1,902,505,206, as compared with $1,623,928,720, an increase of 17 1-2 per cent. The two most important mineral products were coal and iron, the value of the former having been $513,079,809, and of the latter $505,700,000.

MEXICO.

The Government has under consideration the enactment of new mining laws, which have created much discussion among mine operators. The questions raised include the ownership of residues from reduction plants and mills, the disposition of the waters from the mines and mills, the subdivision of mining properties, and the registration of mining titles.

SOUTH AFRICA.

An effort is being made in London to secure additional capital for the development of platinum mines in the Albany district, Grahamstown, Cape Colony. Samples of the rock are said to assay as high as 17 oz. 16 dwts. platinum to the ton.

The Johanessburg correspondent of the *Mining Journal* (London) states that the advent of the Victoria Falls Power Company inaugurates a new era in the production of electric power on the Witwatersrand, and in some instances a load factor of over 90 per cent. is being regularly maintained.

An interesting paper on the "Origin of the Gold in the Rand Banket" was recently read before the Institution of Mining and Metallurgy by Prof. J. W. Gregory, wherein he arrives at the conclusion that the theory in best agreement with the facts seems to be that which regards the banket as a marine placer in which gold and black sand were laid down in a series of shore deposits. The gold was in minute particles, and it was concentrated by the wash to and fro of the tide, sweeping away the light sand and silt, while the gold collected in the sheltered places between the larger pebbles. The black sand deposited with the gold has been converted into pyrites, and at the same time the gold was dissolved and deposited in situ.

AUSTRALASIA.

A new copper field of great promise is reported to be developing in Cangai, in the Grafton district of New South Wales. The deposits are said to be of enormous size, while the conditions are such that costs are very much lower than in any other copper district in Australia. The metal is at present being obtained at a cost of $165 a ton, as compared with from $100 to $250 a ton in other New South Wales districts, of $66 a ton in Queensland and $350 in South Australia.

STATISTICS AND RETURNS.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ended November 15 totalled 22,043 tons, a daily average of 3,674 tons.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending November 22nd was 18,508 tons, a daily average of 3,085 tons. For the corresponding week of last year the output was 7,791 tons, a daily average of 1,298 tons.

Despite the shut down of the Boundary Mines and smelters in the middle of last week, the ore receipts at the smelters show a respectable total, to a large extent made up of ore in transit. It is generally considered that the shut down, for which as yet no cause has been assigned, is not likely to last.

Appended will be found the ore shipments in detail for the week ending November 16th and year to date in tons.

Boundary shipments—Week, 27,618; year, 1,139,708.

Rossland shipments—Week, 6,162; year, 242,935.

Slocan-Kootenay shipments—Week, 4,455; year, 143,125.

The total shipments from the mines in the above districts for the past week were 38,235 tons and for the year to date 1,525,768 tons.

BRITISH COLUMBIA SHIPMENTS.

Nelson, B.C., Nov. 23.—Following are the ore shipments and smelter receipts in Southeastern British Columbia districts for the week ending November 23 and year to date in tons:—

Shipments—	Week.	Year.
Boundary	1,273	1,140,981
Rossland	6,407	249,742
East of Columbia River	3,689	156,714
Totals	11,369	1,547,714
Smelter receipts—		
Trail	7,080	237,249
Northport	919	88,529
Marysville	600	28,200
Others	.....	1,110,079
Totals	8,599	1,464,057

DOMINION COAL OCTOBER OUTPUT.

Output.—No. 1, 52,569; No. 2, 59,241; No. 3, 34,036; No. 4, 56,269; No. 5, 43,707; No. 6, 19,719; No. 7, 14,277; No. 8, 26,542; No. 9, 38,655; No. 10, 4,994. Total, 350,009.

Total shipments, 306,108, approximate.

Dominion Coal Company's outputs for first half of November, 1907:—

No. 1, 24,900; No. 2, 34,180; No. 3, 16,120; No. 4, 27,300; No. 5, 27,510; No. 6, 11,440; No. 8, 10,340; No. 9, 18,360; No. 10, 4,050. Total, 174,200.

The mines during the week ending November 9th from the Rossland camp have shipped normally. There is a larger output than ever before from the Granby mine, which has a record week, but otherwise the Boundary mines have not improved recently. Great activity is being shown in the Slocan and in Kootenay mines generally in the silver lead and gold quartz districts. There are a far larger number of mines shipping than has been the case for some time past and new mines are being added to the shipping list every week.

Boundary shipments—Week, 32,233; year, 1,112,090.

Rossland shipments—Week, 5,775; year, 236,773.

Slocan-Kootenay shipments—Week, 4,191; year, 138,570.

The total shipments from the mines in the above districts for the past week were 42,109 tons and for the year to date 1,487,433 tons.

COBALT SHIPMENTS.

Cobalt ore statement for the week ending November 9th, to November 16th, 1907:—

La Rose Mine—To Denver, Col., Nov. 11th, 65,000; Nov. 11th, 45,000; Nov. 11th, 65,000; Nov. 13th, 53,000; Nov. 13th, 43,000; Nov. 14th, 44,000; Nov. 14th, 43,000; Nov. 15th, 66; Nov. 16th, to New York, 41,100; Nov. 16th, to Denver, 88,000; Nov. 16th, 66,000. Total, 619,100.

Nipissing Mine—To New York, Nov. 12th, 61,720; Nov. 14th, 60,570; Nov. 16th, 60,170. Total 182,460.

McKinley-Darragh Mine—To Penn. Smelting Co., Carnegie, 61,160; Nov. 15th, 60,110. Total, 121,270.

City of Cobalt Mine.—To American Smelting & Refining Company, Perth Ambody, N.J., Nov. 14th, 63,950; Nov. 14, 37,280. Total, 101,230.

Total—1,024,060.

Cobalt ore statement for the period November 2nd to 9th, 1907:

Nipissing Mine—To New York, Nov. 4th, 32,443; Nov. 4th, 41,127; Nov. 8th, 61,470. Total, 135,040.

La Rose Mine—To Denver, Col., Nov. 5th, 66,000; Nov. 5th, 66,000; Nov. 5th, 68,000; Nov. 7th, 40,000; Nov. 7th, 40,000; Nov. 8th, 65,000; Nov. 8th, 40,000; Nov. 9th, 40,000; Nov. 6th, 32,040. Total, 544,040.

O'Brien Mine—To Delore Mining Company, North Bay, Nov. 6th, 260,000.

Buffalo Mine.—To American Smelting & Refining Company, Denver, Col., 40,000.

Kerr Lake Mine—To Kerr Lake Mining Company, Perth Amboy, N.J., 62,040.

Total—952,120 lbs.

AVERAGE PRICES OF COPPER—NEW YORK.

	Electrolytic.		Lake.	
Month.	1906.	1907.	1906.	1907.
January	18.31	24.56	18.41	24.88
February	17.86	24.93	18.11	25.20
March	18.36	25.07	18.64	25.47
April	18.37	24.27	18.63	24.87
May	18.45	24.15	18.72	25.17
June	18.44	22.82	18.71	24.01
July	18.19	22.12	18.58	21.31
August	18.43	18.35	18.61	18.25
September	19.14	15.56	19.20	16.04
October	21.27	13.12	21.71	13.87
November	21.99	.....	22.34	.....
December	23.03	.....	23.38	.....
Year	19.35	.....	19.60	.....

Julius Matten, 25 Road Lane, London, E.C., supplies the following figures of the world's production of pig lead, in English tons: 1904, 985,069; 1905, 990,920; 1906, 975,610. In metric tons the figures stand—1904, 999,844; 1905, 1,000,784; 1906, 990,244. The year average prices of soft lead per pound in New York and per ton in London are:—New York—1904, 4.45 cents; 1905, 4.84; 1906, 5.78 1-2. London—1904, £11 19s. 8d.; 1905, £13 14s. 4d.; 1906, £17 7s. During the years the highest monthly average was obtained in December, 1906, being 6.08 cents and £19 12s. 6d.

Canada's porduction is given thus:—English tons—1904, 12,-143; 1905, 17,125; 1906, 16,991.

In 1906 the United States, Spain, Germany, Australia and Mexico were the chief producers. Canada comes eleventh on the list.

The following are the figures of German consumption of foreign copper for the months January-Steptember, 1907:—Imports of copper, 93,867 tons; exports of copper, 6,387 tons; consumption of copper, 87,480 tons; as against during the same period in 1906 of 91,340 tons.

Of this quantity 73,616 tons were imported from the United States.

Figures received from L. Vogelstein & Company.

Company Notes.

Butte Coalition Copper Company has reduced its quarterly dividend from 50 to 15 cents a share.

The annual meeting of the Nova Scotia Cobalt Silver Mining Company is called for Monday, December 2nd, in Montreal.

The annual meeting of the Coniagas Mine, Limited, was deferred until November 28th on account of the inability of Mr. Milton Hersey, of Montreal, to attend on the 26th.

At the annual meeting of the Pathfinder Mining Company, held a few days ago in Grand Forks, the following officers were elected: President, W. K. C. Manly; vice-president, G. H. Ruthford; secretary-treasurer, R. F. Petrie; board of directors, Dr. Kingston, Thos. Newby, and A. W. Fraser.

The Westinghouse Machine Company and the Westinghouse Electric Manufacturing Company have secured large Pacific coast contracts during the past week. The contracts total nearly $2,000,000. Both companies are in a decidedly easier position.

The November dividend of the Consolidated Mining & Smelting Company is, like the other six previously paid, at the rate of ten per cent. per annum, or two and one-half per cent. quatrerly, the same amount having been paid quarterly for the last twenty-one months. As the company has an issued share capital of $5,355,200, divided into 53,552 shares of $100 each, this last payment made the dividend disbursement amount to $133,880. Including the six dividends heretofore paid, themselves amounting to $714,945, the total amount thus far paid in dividends by this company amounts to $848,825.

The Waverley Hydraulic Mining Company declared a dividend of $5.50 per share at the annual meeting of the stockholders at Barkerville. This is 50 cents per share more than last year. The yardage moved was 27,200, of which 4,600 cubic yards was from the lost channel, and 12,600 cubic yards from the Grouse Creek channel. The average value was a shade under 36 cents per cubic yard. More than half the gold came from the Grouse Creek channel, which is therefore richer than the other. While the clean-up was in progress a slide of bed rock amounting to 3,000 cubic yards or more came down from the west rim of the east channel, covering a part of the uncleaned ground, so that not all the gold was recovered this year from the season's piping on that channel. One hundred and forty-four feet of the old sluice flume was rebuilt with new boxes at the end of the season.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.

Antimony—8 3-4 to 11 cents per lb.

Arsenic, white—7 cents per lb.

Barytes, crude—$18 to $20 per short ton.

Bismuth, metal—$1.75 per lb.

Cadmium, metal—$1.60 per lb.

Carbons for drills—$70 to $90 per carat.

Carborundum, powdered—8 cents per lb.

Chromium, metal pure—50 cents per lb.

Cobalt, f.o.b. Cobalt, Ont., unrefined—30 to 40 cents per lb.

Corundum—7 to 10 cents per lb.

Feldspar, ground—$10 per short ton.

Feldspar, lump—$8 to $13 per long ton.

Graphite, domestic—$50 to $150 per ton.

Gypsum, lump—$7 per short ton.

Infusorial earth, ground—$15 to $30 per ton.

Manganese, pure metal—75 cents per lb.

Mica, ground—$40 to $70 per short ton.

Mica, scrap—$10 to $15 per short ton.

Molybdenum, pure—$1.70 per lb.

Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.

Nickel, metal—45 cents per lb.

Platinum, ordinary metal—$26 to $26.50 per ounce.

Platinum, scrap—$19 per ounce.

Pyrite—10 to 11 3-4 cents per unit for 38 to 45 per cent. sulphur, lump ore or fines.

Quicksilver—$45 to $46 per 75 lb. flask.

Sulphur—$10 to $21 per long ton.

Talc—$15 to $30 per short ton, crude.

Tungsten, pure metal—$1.30 per lb.

Tungsten ore, 60 per cent. pure—$9.50 per unit.

MARKET NOTES.

Silver.—Nov. 7th, 59 3-8; Nov. 8th, 58 1-2; Nov. 9th, 68 1-8; Nov. 11th, 58 1-8; Nov. 12th, 58 3-4; Nov. 13th, 58 1-2; Nov. 14th, 58 1-4; Nov. 15th, 58 1-4; Nov. 16th, 58 1-2; Nov. 18th, 58 7-8; Nov. 19th, 59 1-2; Nov. 20th, 59 1-4. Mexican dollars, 47 cents. Sterling exchange, $4.860.

Copper.—New York, on November 20th, Lake, 13 1-4; electrolytic, 13; London, £58 3s. The market is still depressed. The financial depression is holding back buyers. Producers, on the other hand, do not wish to accept large orders at present prices.

Spelter.—Market quiet. There has been a heavy fall in prices. New York, 4.90 cents per lb.; London, £21.

Lead.—Market is continuing to weaken. New York, 4.30 cents; London, £16 17s. 6d. for Spanish.

Tin.—Market strong. New York, 31 cents; London, £135 15s. for spot.

Pig Iron.—At Pittsburg No. 2 foundry has fallen to $18.50, Bessemer $20.

Catalogues and Other Publications.

Merck's 1907 Index (third edition). An Encyclopedia for the Chemist, Pharmacist and Physician. Merck & Company, 15 University Place, New York. In this well bound, clearly printed volume are listed all of Muck's standard, rare and newest products. The Index is not a price list; but comparative values are indicated by a special code. Appended to the name of each substance is an abbreviated list of its physical and chemical properties.

The Westinghouse Machine Company's Catalogue P. is the first pamphlet we have seen devoted exclusively to storage batteries for portable service. The batteries are made for a wide range of service—for car lighting, for electric locomotive power, for auto trucks, and for any purpose in fact for which a storage battery is used. The prices of elements and of all accessories are plainly listed. Portable batteries vastly increase the utility of this form of energy. For certain varieties of mine work nothing could be more efficient than the modern, compact, efficient portable storage battery.

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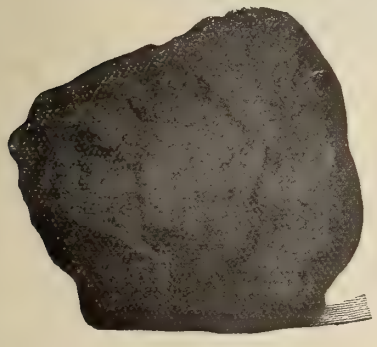
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The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at $1 per acre.

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An applicant may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

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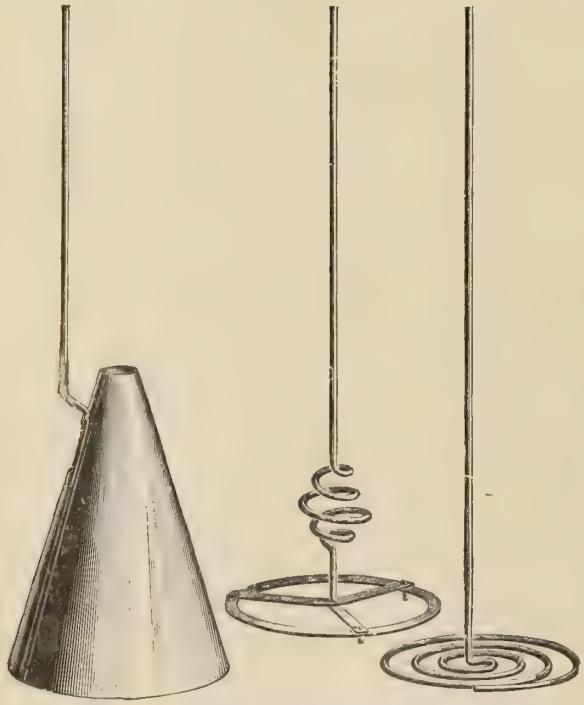
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R. W. BROCK

Acting Deputy Minister of Mines and Director of the Geological Survey of Canada.

Pages of Special Interest

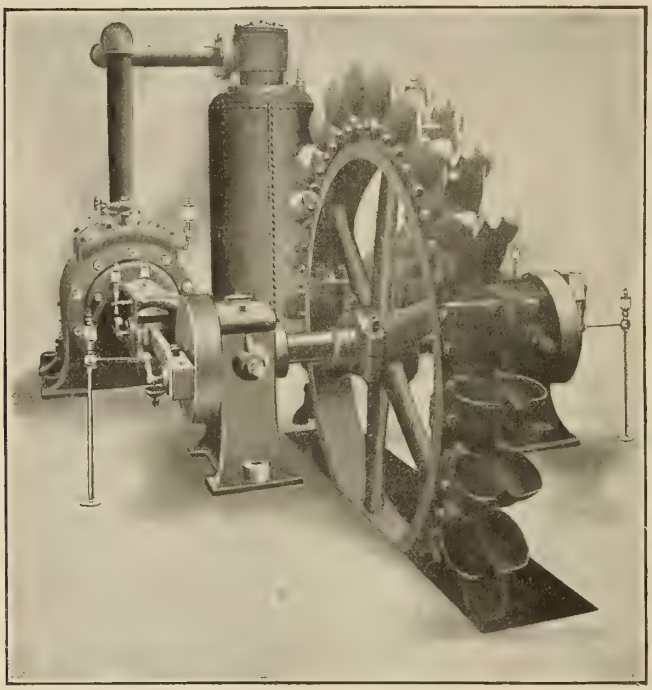
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BUYERS' DIRECTORY - - - - - XXX

WANT ADVERTISEMENTS - - XVII
PROFESSIONAL CARDS - XIX, XX XXI and XXII
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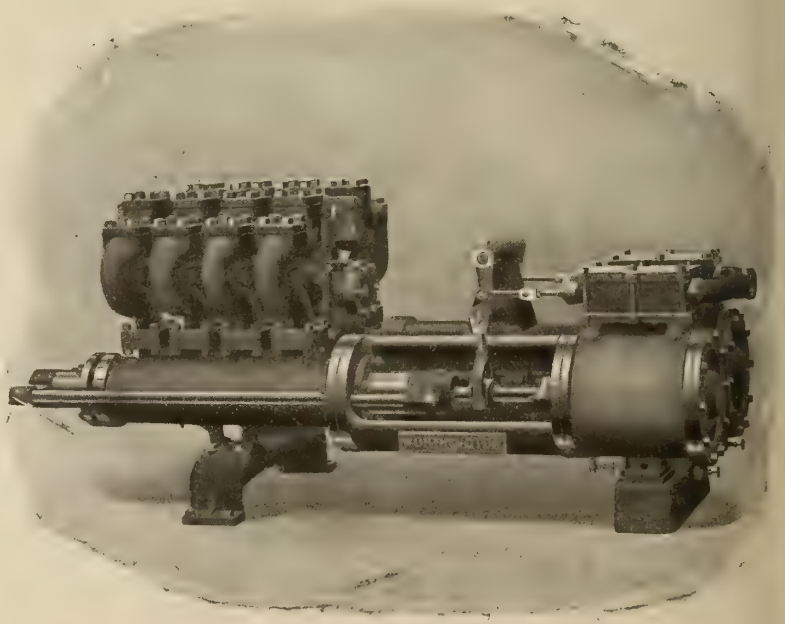
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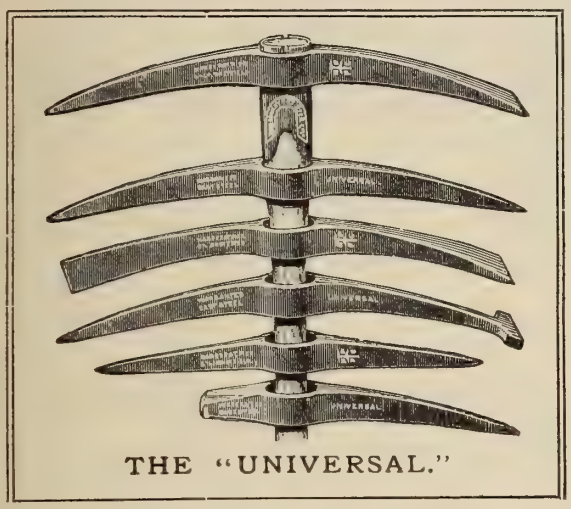
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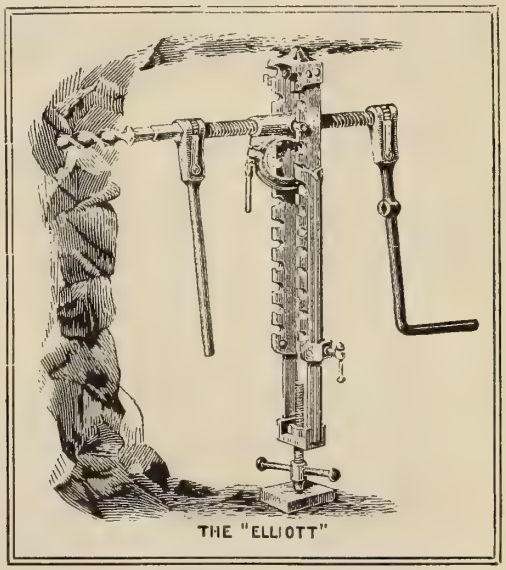
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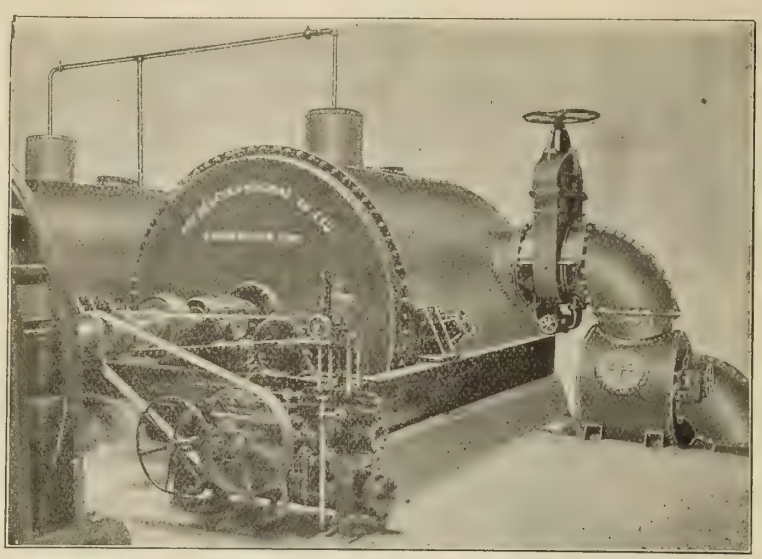
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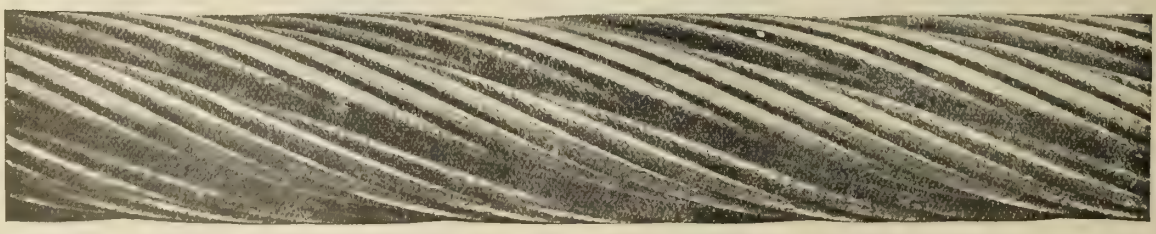
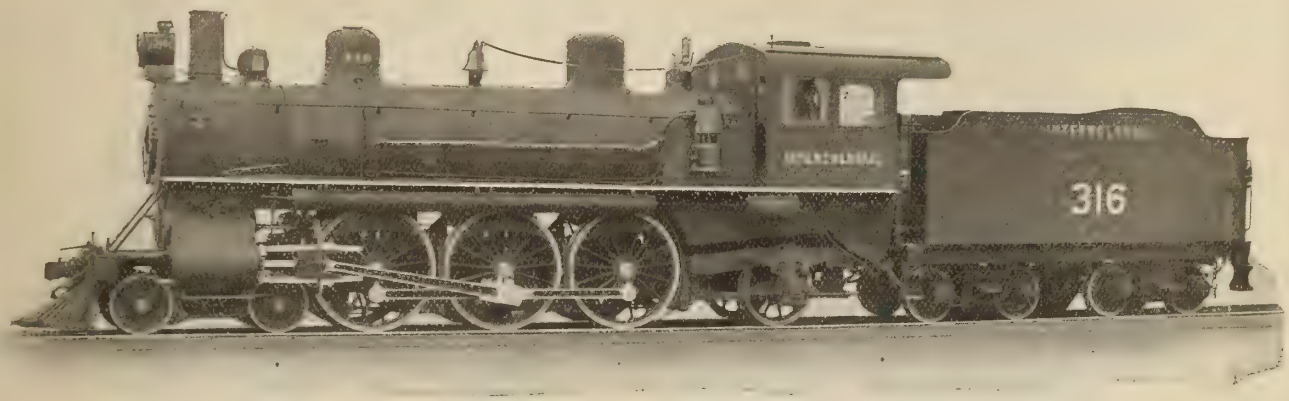


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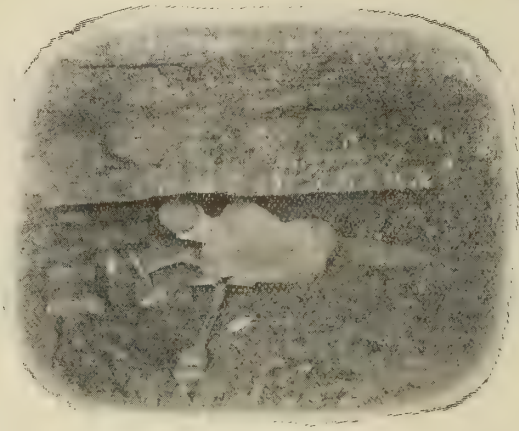
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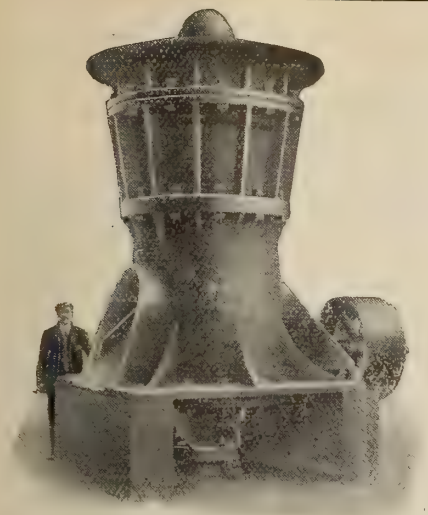
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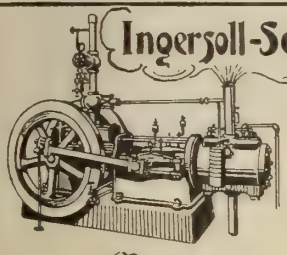
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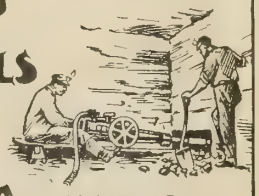
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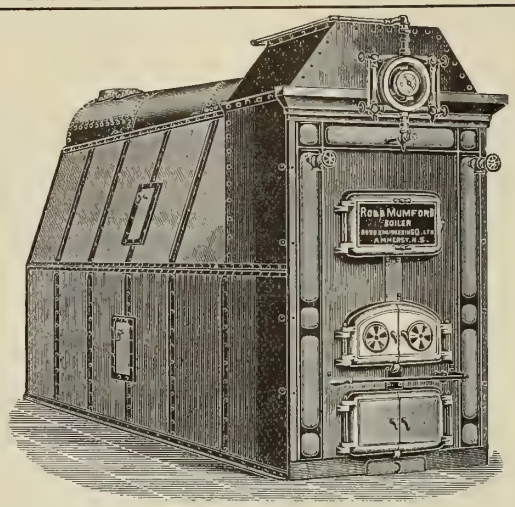
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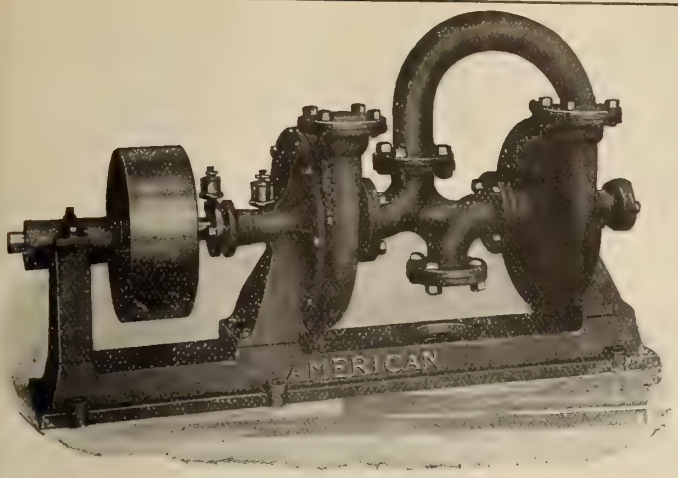
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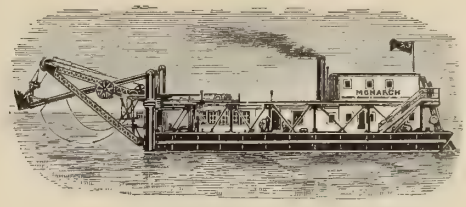
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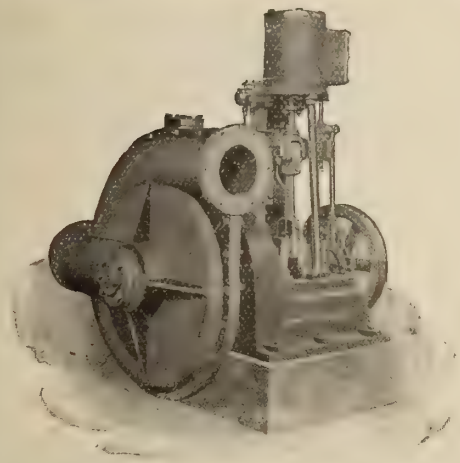
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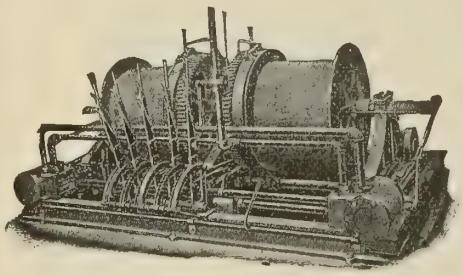
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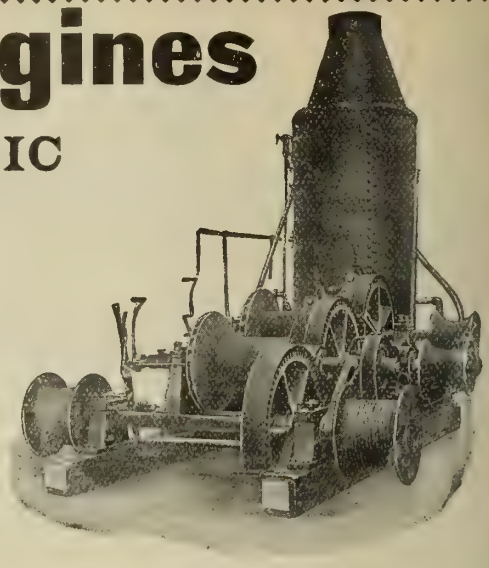
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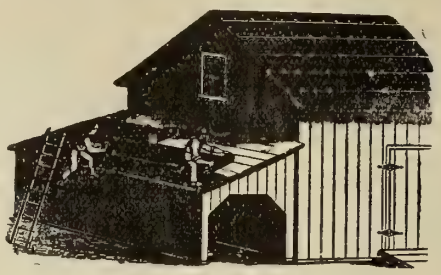
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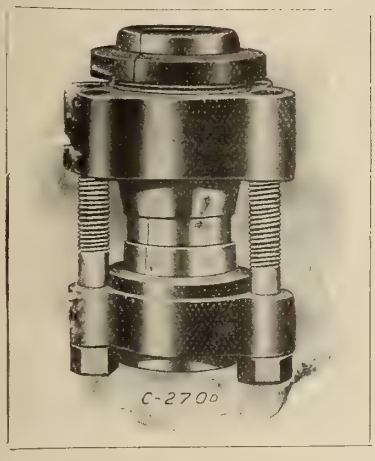
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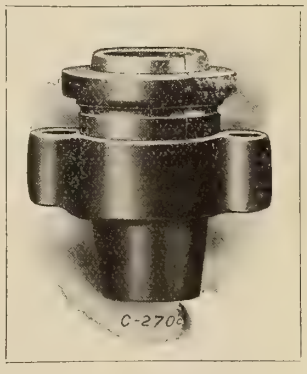
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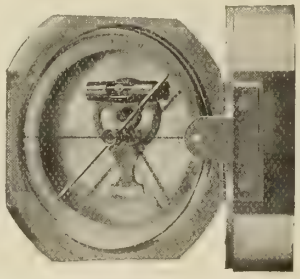
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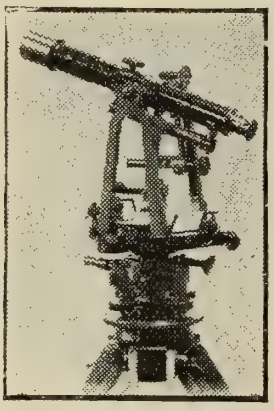
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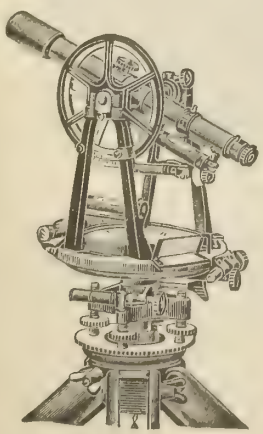
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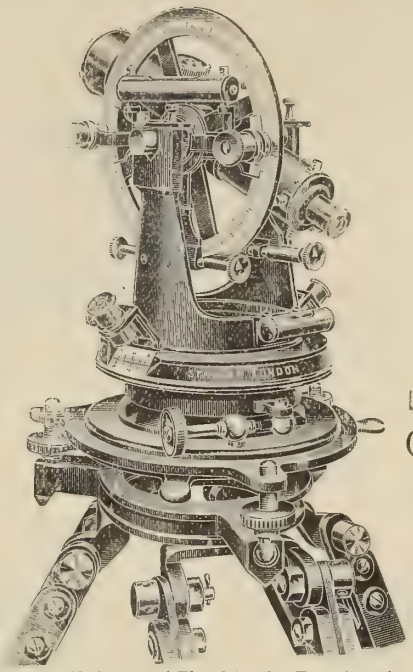
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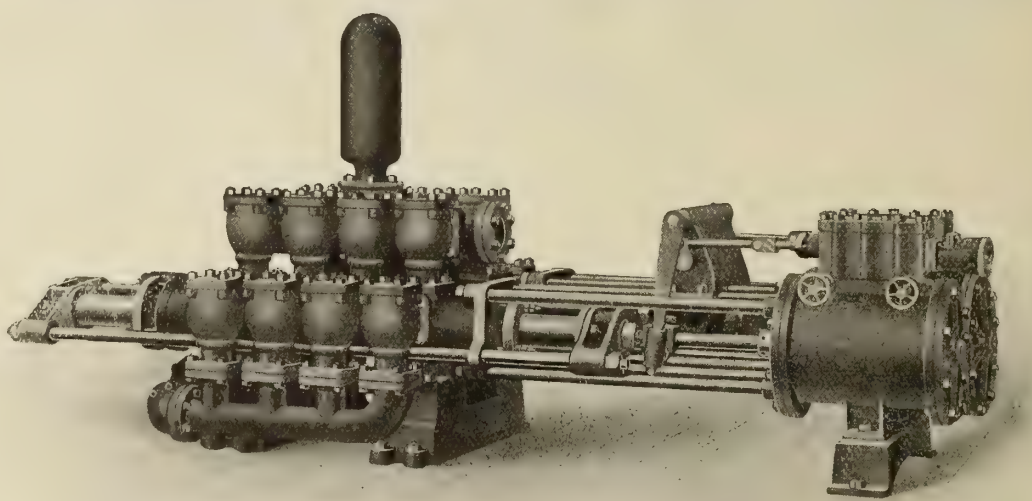
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THE NEW DIRECTOR.

The appointment of Professor Reginald W. Brock to the position of Acting Deputy Minister and Director of the Geological Survey of Canada has been announced.

Referring, in a recent editorial, to the manner of man needed for this dignified and responsible office and to the Survey's need of reorganization, we stated that the new Director should be young, energetic, fearless and entirely free from political strings.

It is with sincere pleasure, then, that we congratulate the new Acting Deputy Minister and Director upon his appointment, and the Minister of Mines upon his choice.

Mr. Brock is young. His academic career, although undeniably brilliant, may also be more adequately described as one of exceptionally solid attainment.

As a field geologist Mr. Brock has stood almost pre-eminent among the geologists of Canada in at least one most important respect. In his work, more especially in British Columbia, he has subordinated the academic to the economic.

This very consideration, along with a knowledge of Mr. Brock's academic and professional successes, was doubtless the deciding factor in the Government's choice.

The Department of Mines and Canadian Geological Survey do not require a savant as their head. Neither do they need a specialist. Either variety of man would prove a hindrance.

What the Department and the Survey need (and in Mr. Brock this need we believe is filled) is a virile young Canadian, who knows Canada's needs at first hand.

The work of the Geological Survey cannot be delegated to others. The Survey's traditions, its honorable record in the face of meagre appropriations and political strife, are dear to every Canadian. It is to be hoped that the new Director will be supported, not only by the officers of the Survey as a whole, but by all the mining men of Canada.

To a very large extent the growth and advancement of Canada's mineral industries depend upon the intelligent activities of the Geological Survey. The Survey will be of incalculable benefit to the country if, from the first, obstacles are cleared away from the Director's path and if he is strengthened by a clear knowledge of the fact that the mining fraternity is solidly for him.

SMELTER SMOKE.

On another page we reprint from our valued contemporary, the *Mining and Scientific Press*, an article on smelter smoke. In view of the proposed establishment of a smelter for treating the arsenic ores of the Cobalt

and other districts, and the probable erection of a large iron smelter within a very short distance of Toronto's business section, this article should be read with care.

Attention is particularly directed to the fact that many complaints received by the authorities in smelting districts of the United States are exaggerated or even baseless.

Like the accident artist who makes the street railway pay damages on pre-arranged accidents, the farmers of the Western States have persistently presecuted the smelters.

If Toronto is to encourage the growth of metallurgical establishments within her limits she must take care not to be misled by the hypersensitive nostrils of sensation mongers.

At Deloro hardly a trace of arsenic is lost. Although many thousands of tons of highly arsenical ores have been treated there, no damage whatever has been done to the surrounding country.

STUDENT AUTONOMY.

For long Queen's University has encouraged her students to take in their own hands the enforcement of discipline. The students of each faculty have their own particular tribunal. The Arts "Concursus" and the Science "Vigilance Committee" are swift to punish error, pride, and disrespect in fellow-students. From the decisions of these courts there is no appeal. Sentences are carried out with speed and precision. Consequently there is seldom any need of interference on the part of the professors.

Following the admirable example of Queen's, the University of Toronto is making the undergraduates responsible for the preservation of law and order through committees chosen by the students themselves. This is discreet. Self-government induces self-respect. Self-respect inhibits acts of vandalism.

SCHOOL READERS.

To Mr. J. B. Tyrrell's article on "School Readers" we have given a prominent position in this issue of THE CANADIAN MINING JOURNAL.

With crisp directness Mr. Tyrrell indicates the vital need of teaching our children something about an industry which is of paramount importance to Canadians.

No argument is needed to support the dictum that a knowledge of the history and value of Canadian mines and minerals would be of infinitely greater value to the rising generations, than much of the meretricious, sentimental "literature" that is now considered essential to a child's education.

Undoubtedly no sounder, truer foundation for citizenship could be laid than by imparting to school children a definite conception of the story of Canada's mining industry.

Mr. Tyrrell refers to the history of Silver Islet. For sheer romance and engrossing interest Silver Islet's story can hardly be paralleled. And yet, we suppose, not one child in a thousand knows that there ever was a mine on Silver Islet.

Take, as other illustrations, the discovery of Copper Cliff, the finding of Cobalt, the checkered history of the Lake of the Woods, the early rush for gold in Nova Scotia, the struggles of the iron industry in Ontario and Nova Scotia, the drama of gold, silver, lead and zinc in British Columbia, the discovery of gold in the Yukon—is not any one of these subjects pregnant with inspiration for the youth of our land?

We need not look into the dim past for heroes. There has been, and there is now, more quiet heroism in the pioneer and prospector, in the working miner and in the mine manager, than in all the bold, bad barons of the middle ages.

Mr. Tyrrell's paper is more than timely—it is of very deep significance. Indirectly mining men themselves have something to learn from it. Between the lines they may gather that now, as always, the claims and duties of citizenship are as binding upon the mining fraternity as upon any other class of men.

A GOOD REPORT.

The annual report of the directors of the Consolidated Mining & Smelting Company of Canada was noticed briefly in our last issue. The report is, however, worthy of more detailed attention. A cursory glance through the attractive pamphlet is edifying.

For the year ending June 30th, 1907, the Centre Star and Ware Eagle group produced 81,788 tons of ore, yielding 32,306 ounces gold, 27,808 ounces of silver, and 1,030,529 pounds of copper. The total value of these metals was $893,239. The corresponding figures for the St. Eugene mine were: 127,645 tons of ore, 24,737 tons of concentrates, yielding 675,959 ounces of silver and 29,391,389 pounds of lead, valued at $1,713,933. The Snowshoe produced 49,002 tons of ore, 2,989 ounces of gold, 16,171 ounces of silver, 1,372,056 pounds of copper, a total value in metals of $397,141.

At the Trail smelter 222,573 tons of ore were smelted, yielding a total value in metals recovered of $3,786,146.

Resolving these figures into averages, we find that the Centre Star and War Eagle are averaged $10.92; the St. Eugene ore, $13.43; the Snowshoe ore, $8.10. The ore smelted at Trail averager $17.01.

Since March, 1898, the Trail smelter has produced metals the gross value of which is estimated at $25,800,231.

In the Centre Star and War Eagle group there are about sixteen miles of underground work and about ten miles in the St. Eugene. A large total of underground development and of diamond drilling was performed during the year.

Nearly half a million dollars were expended in new construction and improvements.

To guarantee an adequate supply of lead ore for the Trail smelter the Consolidated has entered into an agreement with the Canadian Metal Company, whereby it secures the Canadian Metal Company's entire output of lead and zinc concentrates for a period of years. The Consolidated Company has a strong hold upon the Canadian, Chinese and Japanese lead markets. Hence this step was necessary.

The report is signed by W. H. Aldridge, managing director. It concludes with a warm recognition of the valuable services of several of the company's officers. To Mr. R. H. Stewart, mine manager, is attributed the excellent condition of the company's mines.

Messrs. Jules Labarthe, T. W. Bingay, William Chambers, John F. Miller, A. J. McNab, all of whom are officials connected with the Trail smelter, are given especial credit. Mr. R. Purcell, Mr. W. P. White, Mr. Charles Biesel and Mr. John M. Turnbull, who are responsible for various individual mines, are placed in the same roll of honor.

Such open recognition of faithful services, coming from a superior officer, is evidence of harmony and cooperation among the various members of the staff.

THE VALUE OF CORRESPONDENCE INSTRUCTION TO THE MINING MAN.

This is the title of a paper read by Mr. H. H. Stoek, editor of *Mines and Minerals,* before the American Mining Congress at its annual meeting in Joplin, Missouri.

Mr. Stoek traces the history of the International Correspondence Schools. The story of the origin and phenomenal growth of this institution is one of absorbing interest. The actual beginning of mining instruction was made about 1885 by Mr. T. J. Foster, who started a series of technical articles in the *Mining Herald,* published in Shenandoah, Pa. These articles "were intended to assist the ambition and studious men about the mines."

From this small beginning has resulted a system through which 34,496 persons have received mining instruction.

The success of this important movement is justly attributed to the actual need of just such simple, flexible and practical educational method and to liberal "inspirational" advertising.

By means of carefully compiled statistics, Mr. Stoek demonstrates that in general the correspondence student makes a more energetic and successful miner than the miner who relies upon his unaided intelligence. The fact is accentuated that no man can learn by correspondence unless he is willing to make sacrifices of his spare time, and that this very willingness argues the presence of more than average backbone.

Many mining engineers, graduates of technical colleges, pay for a correspondence course for the sole purpose of securing a set of the International text-books. Others again, after leaving college, take the correspondence course as a supplementary training.

Reading Mr. Stoek's clear and forceful paper impresses one with two things. Firstly, the International Correspondence Schools have done a vast amount of good. They have opened the way to promotion for hundreds of men to whom the doors of our colleges are closed. They have imparted the right kind of instruction in the best available way to the men who most needed it. For these men, workmen, foremen, and bosses, our Canadian educational systems have made little or no provision. Only in Nova Scotia is a serious attempt being made to meet the requirements of these classes. Hence, both in Canada and the United States the correspondence system has performed a function of extreme importance.

But, excellent as is the system of the International in conception and in administration, efficient and complete as are its courses, it is obvious that its very existence is due to a vital defect in our present educational conditions. The absence of any provision in our schools and colleges for means to do the work that is done by the correspondence schools is anomalous and anachronous. We are not over-stating the claims of what, for lack of a better name, we designate the laboring classes, when we say that in all large communities they are and must be paramount. These claims our educationists have so far neglected to consider, and the correspondence schools have filled the gap.

The correspondance schools, of which the International is by far the largest and most important, have been created to supplement present educational systems. In this sense they are an artificial growth. To Canada their existance means a loss in money; but, also, a more than compensating gain in the increased efficiency of student-workmen.

It has often been pointed out that this money should be kept in Canada. This, however, is not the point. The benefits conferred by the International Correspondence Schools alone are worth more than can be expressed in terms of money.

The real question is this—must we not, as Canadians, see to it that to every man is given at all times the opportunity of securing exactly the kind of education he needs? It is not necessary to disparage the correspondence schools. It will, rather, be necessary to emulate them.

A ROYAL COMMISSION NEEEED.

The Toronto Branch of the Canadian Mining Institute has formally requested the Ontario Government to appoint a Royal Commission "for the purpose of revising, simplifying and amending the 'Mines Act' and the 'Act to Supplement the Revenues of the Crown.'"

The memorial suggests that at least one-half of the members of the Commission be chosen from the ranks of Ontario branches of the Canadian Mining Institute.

This course has been recommended after mature deliberation. It is confidently expected that every mining man in Ontario will support the movement.

It has been found impossible to obtain, through local meetings, any set of recommendations that would meet the whole situation. Special interests crop up, grievances are aired, and only one or two phases of the problem are discussed. So complicated are the questions of mining legislation and special taxation that the closest attention of a picked group of specialists for a considerable period will be required before comprehensive and constructive revision can be possible.

We endorse most heartily the request of the Toronto Branch.

It is unnecessary to dilate upon the large and urgent problems awaiting the attention of the Royal Commission. But we may reiterate our belief that the need of such a Commission is indisputable.

NOVA SCOTIA'S IRON ORES.

The annual report of the Department of the Interior includes the report of the Superintendent of Mines, the preliminary reports of Dr. J. E. Woodman, Mr. F. Hille, and Mr. Fritz Cirkel, on the iron ore deposits of Nova Scotia, Western Ontario and the Ottawa Valley, respectively.

Dr. Woodman advocates the payment of a cash bonus direct to the operators of small iron ore deposits. The necessity of this, as a stimulant to development, is particularly noticeable in Nova Scotia. The present system of bounties enriches the stockholders of iron and steel companies and has very little effect upon the operators of mines.

Referring to the Torbrook-Nictaux basin, Dr. Woodman characterizes this district as the most promising iron field in Nova Scotia. The country is open, a substantial water power at Nictaux Falls awaits utilization, transportation is easy, and within a few miles an abundance of hardwood timber is available.

The "basin" is described as either a large syncline or a succession of smaller folds, the axes of which run approximately north 55 degrees east to north 60 degrees east. The ore is interstratified, having replaced limestone beds. The basin's limits are vague, and have not yet been clearly defined. But many square miles have been explored already. The Annapolis Iron Company, controlled by the same interests that operate the Londonderry furnace, owns these ore deposits and ships ore to Londonderry. High grade hematites and siliceous magnetites are found in large quantities. All of the ore is phosphatic and most of it carries from two to eight per cent. of lime.

After touching upon the Clementsvale, North Mountain, Brookfield and Cobequid districts, Dr. Woodman takes up the Arisaig deposits of Antigonish County. As now known the Arisaig ores run east and west for a distance of five and one-half miles.

The Arisaig bedded hematites occur in nearly vertical veins and, so far as known, as continuous for a great length on the strike. Vertical sections of the highest and lowest exposures give a depth of 350 feet. No drilling has been done to prove the deposits to greater depth. In the western part of the field the ore is less silicious and freer from trap intrusions. All of the ore, Dr. Woodman states, averages under fifty per cent. metallic iron in car load lots. Water power of not inconsiderable magnitude is available.

Dr. Woodman demonstrates the need of careful investigation of the whole Arisaig field.

To the reports of Messrs. Hille and Cirkel we shall refer later.

COBALT RESPONDS.

As has been expected, Cobalt has responded to the call upon her energies. November's output exceeded by more than one hundred per cent. that of any previous month. Shipments amounted to twenty-five hundred tons. Comparing this with previous figures, it becomes apparent that Cobalt is but beginning her career as a producer. But even these figures are not to be taken as indicating Cobalt's entire output. Several of the richer mines are holding several car loads each of high grade ore and concentrates. Altogether there are at least thirty cars of this high grade material being held in stock on account of difficulties with the smelters. Thus, although Cobalt is doing well, there is sound reason to believe that unexpectedly greater shipments will be begun and continued throughout the coming year.

Several special agents of English, German and French smelters have visited Canada recently. We believe that the principals whom these gentlemen represent are prepared to take advantage of the present friction between American buyers and Canadian shippers of ore. But (and this is most significant) the trend of inquiry is markedly for ores containing high percentages of cobalt. It will not, therefore, be surprising if a wider market develop within the very near future. As pointed out before, this will mean renewed activity in Portage Bay and like districts.

WISDOM.

The Rossland Miners' Union, fully appreciating the difficulties under which mine operators are now struggling, very wisely consented to a reduction in wages. The only possible alternative was a shut-down.

The Rossland mines were closed down for a day to give the miners of both shifts an opportunity of meeting inw discussing the proposed reduction of wages. The referendum vote favored the resolution by a two-thirds majority.

It is gratifying to observe the calm, judicial attitude of the workmen in this conjuncture. This is a practical manifestation of the spirit of mutual helpfulness.

OFFICIAL PUBLICATIONS ONCE AGAIN.

The Canadian Mining Journal recently drew attention to the fact that the usefulness of the Provincial mining reports was considerably lessened by delay in issuing them. This serious drawback from the standpoint of those in search of recent information as to mining development has been noted by others. Mr. Harrison Watson, Canadian representative of the City Trade branch of the High Commissioner's office, London, reports as follows to the Department of Trade and Commerce:—

> "We continue to receive a considerable number of inquiries about Canadian mineral resources, and applications for copies of the reports on mining operations, which are annually issued by several of the Provinces. In this connection several persons have called attention to the apparent delay which occurs in the publication of these reports, whereby much of the news is to a certain extent out of date by the time the particular report is in the hands of the public. There are naturallly difficulties in compiling reports of this description where the material comes from so many sources, but on the other hand it is possible that some improvement might be made in the direction indicated."

Now that a widespread interest in Canadian mineral resources has been awakened in Britain, it is specially important that up-to-date official information should be accessible. So far as the reports of the Ontario Department of Mines are concerned, the difficulty might be overcome by making them considerably less voluminous. In addition to the report proper, dealing with the output and conditions of working mines, a number of special papers and exploration reports are included in the document. The latter, largely of a scientific character and of less timely interest, had far better be omitted and published subsequently in separate form, rather than be the cause of delaying for months the appearance of the practical data regarding actual mining operations which ought to be furnished as promptly as possible in order to be of value.

Editorial Note.

A report from Harrison Watson, of the Canadian High Commissioner's office, London, states that the chemist of one of the largest British manufacturers of grate polish and black-lead, who is proceeding to Corea to examine some plumbago deposits, was furnished with information at the High Commissioner's office concerning Canadian plumbago and his attention drawn to specimens shown at the Imperial Institute. He proposes to visit Canada before returning to England, being of opinion that some the Canadian plumbago would answer the purposes of his company.

A TIMELY WARNING.

F. W. Gray.

The folowing is quoted from an Associated Press Despatch of the 4th of December, descriptive of the conditions prevailing after the recent disastrous explosion of firedamp in the Namoi Mine, of the United Coal Company, near Fayette City, Pennsylvania. "The physicians present have been in almost constant requisition on behalf of the rescuers, who, despite the fact that they work in relays, only a fraction of an hour, are constantly being prostrated by the fumes of gas."

If the information given by the American Associated Press is correct, it discloses a lamentable lack of knowledge in the Pennsylvania coalfield, of the modern breathing apparatus designed for just such cases as the Naomi Mine disaster. We believe it is a fact, that the only breathing apparatus of the modern type in the United States, was that exhibited in a recent exhibition of a Life Saving Society in New York. The United States Government recently detailed an expert to inspect the various Recue Stations on the continent of Europe with a view to having something similar in the coal regions of the States, but so far as we are aware no such provision has as yet been made. It is distressing to hear of men losing their lives, and of brave rescuers toiling in unavailing effort amidst deadly gases, when we know that devices are to be acquired, which would enable these heroic workers to render real assistance to their fellows at practically no risk to themselves. In the old days the death roll of an explosion was more often, than not, augmented by the death of would-be rescuers overcome by the post explosion gases, but to-day with perfected devices such as are used in every colliery district in Europe, there is no need for such a task on the physical powers of rescuers. In this respect the United States is behind even Russia and Spain, in both of which countries, properly equipped Rescue Stations operated by trained gangs of workmen, are made compulsory by the laws of the country. One of the apparatus we have referred to has up to date, the total of 50 lives to its credit, the lives of men who would otherwise have been poisoned by afterdamp. It is strange that the United States should lag behind second-rate European countries in this matter, that the country which boasts of the largest coal output in the World, should care so little about the lives of its miners. Such apathy cannot be from lack of knowledge. It is that the coal operators of America are afraid of humanitarianism or of expending money on apparatus, which do not directly help to pay dividends? There is another side to this matter, however, for the greatest usefulness of the breathing apparatus, we think will be found in that it enables men to extinguish mine fires in their first stages, and for this reason is a sound investment as fire insurance. Many a mine fire that has cost the operators thousands of dollars, could have been extinguished had properly trained men equipped with modern breathing apparatus been ready to respond to the alarm, as they are in Germany, France, Belgium, Austria, Russia, Spain and Britain. The whole subject of rescue work after mine fires and explosions is one that is deserving of the earnest attention of every coal operator. The Courrières disaster compelled public attention to this matter in Europe. If ever such an appalling disaster should visit the States, they will be found very unready in the work of rescue, if we have interpreted the despatch correctly that we first quoted.

THE ACTING DEPUTY-MINISTER OF MINES OF CANADA.

The official announcement that Mr. Reginald W. Brock, Professor of Geology in the School of Mining, Queen's University, Kingston, had been appointed Acting Deputy Minister of Mines and Director of the Geological Survey of Canada has met with the warm approval of all mining men.

Especially in the Provinces of British Columbia and Ontario, where Mr. Brock has done his principal work and where, consequently, he is best known, will the news be most welcome. As a trained mining geologist Mr. Brock has been most successful. In fact he ranks among the most brilliant and substantial of North American practical, economic geologists. Mr. Brock, whose father was a Methodist minister, entered the University of Toronto in 1890. During the summer of 1891, and for several succeeding seasons, he acted as field assistant in Geological Survey parties. In 1893 he left Toronto University and entered upon a course of study in the newly organized School of Mining in Kingston. Graduating in 1895 with high honors in science, he proceeded to Germany. Here for the summer of that year he studied at the University of Heidelburg. His instructors in geology and mineralogy were the famous professors Rosenbusch and Goldschmidt. The following autumn he returned to Kingston to assume the duties of Acting Professor of Mineralogy, Professor Nicol being absent on leave in Europe.

During his course in Toronto Mr. Brock had the advantage of some newspaper training. This experience, valuable to any young man, was of great benefit to Mr. Brock. The effect is easily perceptible in the more than ordinary ease and clearness of his reports.

From 1896 to 1900, inclusive, Mr. Brock was engaged as a permanent officer of the Geological Survey staff. Throughout this period his principal work consisted in developing the mining geology of British Columbia. His brilliant reports upon various mining districts at once won him recognition, and he was soon acknowledged to be one of the leading economic geologists of the day.

It is seldom indeed that recognition comes so unreservedly and so rapidly. But the practical value of Mr. Brock's carefully conducted field work appealed immediately to the mining men of the Dominion.

After spending another year in Heidelberg, Mr. Brock became Professor of Geology in the School of Mining at Queen's in 1902. Since that time Mr. Brock has spent his summers in the field work of the Geological Survey. Most of his work consisted in a detailed examination of the Rossland mining district. At the request of the mining companies themselves he reported upon Le Roi, War Eagle, Centre Star and other Rossland mines. It is this important work that has done more than anything else to establish Mr. Brock's reputation.

The most efficient Geological Survey in the world is that of the United States. The recently appointed Director, Dr. George Otis Smith, is a man of about the same age as Mr. Brock. But it may be doubted if his training and experience have been as complete as those of the new Canadian Director.

Geology as a branch of academic speculation is one thing. Mining geology is a quite different thing. Of the former Canada has had enough. Of the latter all mining men fully appreciate the necessity.

Excellently as the new Acting Deputy Minister and Director is equipped for office, he will not be able to work to best advantage unless he has the outspoken, constant and hearty co-operation of all those interested in the honest, rapid development of Canada's mineral wealth.

SCHOOL READERS.

Probably within a short time the Government of Ontario will revise its readers in use in the public schools, or possibly it may prepare a new set of readers altogether. In either event nothing could be more appropriate than that a goodly number of articles should be included in them descriptive of the mines and mineral industries of Canada, with accounts of their discoveries, growth and progress up to their present condition.

An account of the discovery of nickel at Sudbury and the development of the nickel industry up to its present enormous proportions would make a most interesting and instructive story, while the history of Silver Islet should be known to every child in the Province. Relations of incidents in the lives of prospectors who have travelled in canoes, and on foot with packs on their backs, through the northern forest would be far more entertaining to children than the trivial and mendacious stories of travel and adventure which are now current among the people, and especially among the children.

The value of a large part of Canada must ultimately depend not on its agriculture, fisheries or forest resources, but on its production of mineral wealth; so that mining is and must always be in increasing measure an industry of the first importance to us.

In no way can the people of the country be educated to appreciate the importance of the mining industry better than by informing them of it from their very earliest years through the medium of the school readers. The children might then grow up ambitious to emulate the exploits of some of our most successful prospectors, who have travelled through the wilderness with the constant aim of finding valuable deposits of ore, instead of having their thoughts foolishly centred on bears and wolves with the loveable attributes of the theatrical villain and the appearance of the woolly denizens of the toy shops.

Accurate information about our own mines and mining possibilities and about the hazards of the search for ore, so imparted to the children through the school readers, would form a basis for a sound knowledge of Canadian mining conditions, and of the vast importance of the mining industry to the general progress and welfare of the Dominion, and at the same time would fortify them against the blandishments of the men who endeavor to get their money on the fraudulent pretext that they are investing it for them in mining enterprises.

I trust that not only Ontario, but all the other Provinces in the Dominion, will see to it that the children are taught something about the mines and mining possibilities of Canada, and to that end will incorporate in their school readers, interesting and accurate accounts of their mines and mineral deposits.

J. B. Tyrrell,

9 Toronto street, Toronto, Ont.

UNDERGROUND HAULAGE.

Paper read before British Society of Mining Students.

(*Continued from last issue.*)

Advantages of its use.—The advantages of endless rope, where it can be adopted, are as follows:—

Instead of being worked intermittently, all sections of the mine are sending coal to the shaft at the same time, therefore a constant supply is always being received at the shaft by the onsetters.

No mishap in one district will affect the others, as the clutch gear of the former can be thrown out of action and its rope stopped until the needful work of repair is completed.

No large shaft sidings or inbye landings are required.

Where the road is undulating, the tubs on the dipping gradients help the engine to pull up others on the ascending gradients.

A smaller engine will do the work. It is driven at a constant slow speed, and being fitted with a governor, the speed is kept constant, and it can be made very efficient and economical in the working.

Where few or no coals are coming out of one district, its rope can be thrown out of action, thus easing the work of the engine.

There is no large wear and tear of rolling stock, as accidents from derailed tubs are not so serious, and rarely happen except on heavy gradients.

All sections of the pit are continually supplied with tubs as required.

The engine can be erected on the surface, the band ropes being taken down the shaft and there connected to the main haulage wheels, which are driven by friction clutch gearing.

The engine being in daylight can be better examined and cleaned.

Where haulage roads have to be close-timbered it sometimes is advisable to put in endless rope, because there is less liability for slow-travelling tubs to be derailed, thereby knocking out the props and wrecking the place, than would be the case with the high-speed running of main and tail.

Position of Rope.—There are three particular ways for attaching the tubs to the haulage rope, viz., (1) over the tubs, (2) under the tubs, and (3) at one side of the tubs. One of the first two methods is generally adopted. The last is chiefly used for a certain method, to be referred to later on.

Over Tub Method of Attachment.—This method is applicable where the road is level or has only slight undulations, and is either straight or is curved along some sections. The carrying capacity of the tubs should not exceed 10 hundredweight, and are best not filled much above the level of their sides. The overhead system can in most cases be satisfactorily used, but not in cases where the tubs run on a narrow wheel gauge, or where the wheels are coupled close together, as under either of these conditions there is a great risk of the tubs leaving the rails. The tubs are mostly run singly or in pairs, or in threes; two clips are generally used in the last case, one at each end of the set. The sets or single tubs are kept at regular distances apart, being comparatively close if there are few or no branch roads throughout the course of the main haulage road, and from 10 to 20 yards apart where these branch roads occur frequently, as that interval allows the lads who are stationed at the branch roads ample time to switch the tubs required into their particular districts before the next set reaches them. Light clips are best adapted for this method. Two forms of these, one known as *The Elswick Haulage Clip,* and the other locally known as *Jockeys,* are especially suitable for over attachment of the tubs.

Under the Tub Method of Attachment.—On haulage roads having steep inclinations, or even slight ones, if tubs are loaded with more than 10 hundredweight of coal, more especially where tubs are filled above the sides or where curves or undulations are of frequent occurrence, the under-rope method of haulage is the best to adopt. The underneath rope is better gripped, thus forming a more secure attachment for the tubs. During their transport they are not likely to tilt or leave the rails in passing along the curves. There is less liability for coals to be knocked off the tubs and strewn about the roadway.

Several forms of clip are suitable for this system, such as *Smallman's,* which is much used, also *Middleton's, Fisher's,* and those attached to bogeys run with the sets of tubs.

Clips.—One of the chief things to ensure a successful working of the endless rope haulage is the use of well-chosen forms of clip, as upon these as much as upon anything else must we depend upon getting the tubs carried securely along with a minimum of friction. Any particular form of those on the market will not suit every method of haulage. One may sometimes be best adapted for under-rope attachment, and another for overhead attachment, whilst different makes from either of them may act well on level roads and light gradients, and be an absolute failure on haulage roads having greater inclinations. Some are adapted for hauling one or two tubs at a time, whilst a different and much stronger form is necessary for sets of six, eight, or more tubs. Fortunately we have a varied selection of clips to choose from, and a careful consideration of the conditions of the work we have in view for them must determine the selection of that most suitable for a specific purpose. Where tubs are run separately, in twos, or in threes, a larger number of clips for the whole length of a long engine plane are required of the adapted form. Owing to the necessity for the frequent fixing and detachment of the clips they must be made light and handy, so as to facilitate these operations, and, where practicable, be adapted for use in conjunction with an automatic contrivance for their release from the tubs at curves, landings, and shaft sidings. Stronger clips are necessary for heavy work, or where sets are composed of large numbers of tubs. In such cases the total number of clips required is less for a given output than in the cases of shorter sets or single tubs. Those for attachment to the overhead rope are generally automatically released, but rarely is any device available for automatic release with the under-rope methods of attachment. Whilst where the sets are composed of six, eight, or more tubs, a very strong clip having a vice-like grip, worked with a hand-wheel, is preferable; those of lighter form are tightened by means of a hand lever. Clips may be said to consist of four varieties, viz., forks, lever clips, screw clips and bogey clips. Each variety again is subject to alteration in its construction so as to make it suitable for special work.

Forks.—These in the North of England are known by the names of jockeys, and are used only for over-rope haulage (*See Fig. 8*). One of the simplest and most effective is that shown in the sketch. The stalk fits into a socket formed by two holes a few inches apart, vertically made in the iron hoops at the middle of the two ends of the tub. The projecting plate at its upper extremity has a narrow notch formed in it; in this notch the haulage rope rests, its weight pressing downward sufficiently to grip and carry forward the tub when the rope is in motion. In the case of a heavily loaded tub the pockey is slightly twisted in the socket so as to give the rope a firmer grip. These forks are not trustworthy on roads with steep gradients.

Automatic Release of Jockey.—This is effected by the raising of the rope to such a height as will ensure its leaving the jockey. Ordinarily the overhead rope is prevented from touching the floor of the engine plane by the spacing of the tubs, which are never so far apart as to allow of the rope resting in the jockeys swagging much between. Fig. 9 shows a device which causes the rope to leave the tubs at desired positions. C and D are two vertical supports placed 6 feet apart, the upper portions of which are securely bolted to the roof timbers A and B. The support C is divided at the lower extremity sufficiently to take the small pulley F, and its length is such as to just allow of the rope, in contact with the lowest part of its circumference, resting in the

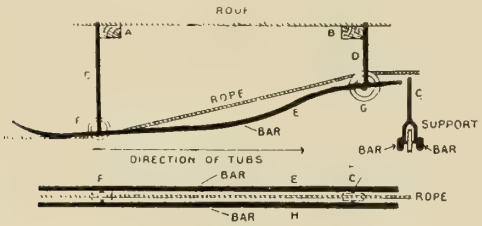


Fig. 9.

UTOMATIC KNOCK-OFF FOR JOCKEY. ENDLESS OVERHEAD ROPE

jockey. The support D is divided at its lower extremity sufficiently to take the small pulley G, and is much shorter than the support C, and the rope rests upon the highest part of its circumference. The supports C and D are connected at their lower extremities by a pair of bars E, H, which bars are spaced two inches apart and bent, as shown in the sketch. The tubs, travelling in the direction of the arrow, on reaching the pulley F continue their further course owing to a descending gradient given to the road, assisted by the impetus of their travel, and the rope, owing to its ascent over the pulley G, is constrained to leave the jockey in which it previously rested.

The Elswick Clip (*Finney's* Patent), shown in Fig. 10.—This is another clip most suitable for over-rope haulage, especially on heavy and undulating roads. It is stronger than the jockey and has a much tighter grip of the rope, a hand-lever on the top acting on a screw-plane to securely fix its jaws round the rope. The stem or stalk of the clip fits a socket formed of two loops or holes similar to that of the jockey; a lug or gib is cast on the stem projecting from one side. As it is inserted in the socket it is given a quarter of a turn round, and in this position the lug catches under the top hoop and cannot return therefrom until it is turned gack again. A knock-off bar, fixed at any required point in the road, comes in contact with the lever at its upper extremity, which is thereby depressed from its vertical position, causing the jaws to open and the rope to be released. These clips are also made with a hook on the top of the stem instead of the gib for fixing over the end of the tub, the lower part sliding into the yoke-hole. As thus

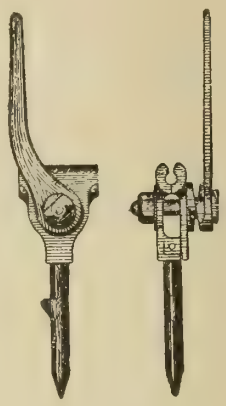


Fig. 10.

THE ELSWICK CLIP.

made the clip is very convenient in use upon level roads, but for all roads with gradients the form having the gib on it is best.

Smallman's Clip.—This clip is often used for under-rope haulage, especially on steep and variable roads. It consists of two plates, loosely connected by a centre bolt. Two jaws at its lower extremity are worked by a hand lever placed at one end to securely grip or release the rope as required, the centre bolt being adjustable to regulate the amount of slackening and closing at the jaws. Either a hook or a link, according to requirement,

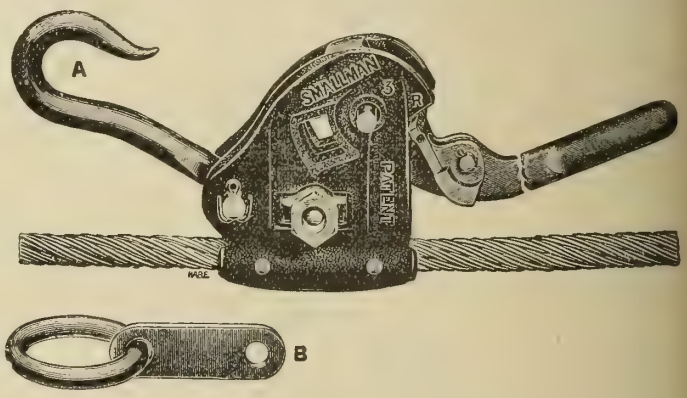


Fig. 11.

SMALLMAN'S CLIP.



Fig. 12.

AUTOMATIC DETACHMENT FOR SMALLMAN'S CLIP. UNDER-ROPE.

is attached to the end of the clip, opposite the lever, for attachment to the tub. This clip can be automatically released from the rope where required. For this purpose a detacher is bolted to a sleeper between the rails. The upper surface of the detacher is curved and fixed at

such a height above the floor as causes the lever of the advancing clip to come into contact and slide over it. The lever is bent, and in continuing its course over the detacher, it is uplifted sufficiently to open the jaws, bringing about the release of the rope, the tub then under the influence of gravity, continues in motion, with the clip attached, to a point upon reaching which it is taken off the tub. Fig. 11 shows this clip, and Fig. 12 the detacher.

Bogey Clips.—These clips are admirably adapted for use on steep haulage roads, or on those where a large number of tubs are run together in sets. The clip

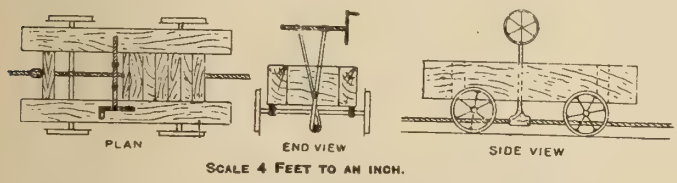


Fig. 13.

BOGEY CLIP.

proper consists of a pair of wrought-iron bars, working scissor-like on a pivot, the lower ends or jaws of which grip the rope when tightened by a right and left hand screw, worked by a small vertically-placed wheed. This clip is fitted to a heavy bogey wherein a lad sits during the runs. (*See Fig. 13.*)

The tubs run in sets of 20 and upwards, larger numbers than 20 at a time requiring a bogey at each end. On approaching branch roads, the rope is released by the run-rider until the switches are turned to direct the set aright, the journey then being resumed, and the sets run in or out, to or from, their respective districts, the rope being gripped again when the set has gravitated round or past the curve. These bogey clips are very strong and rarely get out of order.

Screw Clips.—These are fastened on to the ends of the tubs. They consist of two vertical bars of wrought-iron, fitted with collars near their extremities. A small horizontal projecting bar, bent downwards at the end, is welded on the top of collar. The bent portion can be placed in the yoke-hole of the tub; a bolt and shackle are attached to the lower collar, and form a means of connection, to the tub chains. The longer bar is formed with a foot shaped to receive the rope, which is gripped between the two bars when the shorter, by means of a hand screw at the top, is tightened upon it. The rope

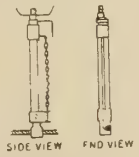


Fig. 14.

SCREW CLIP.

is thus securely seized in the grooved jaws. When this clip is used, sets of three or of six tubs are generally coupled together. Fig. 14 is an illustration of the screw clip.

Curves for Endless Rope.—Curves are rather difficult to lay out for this method of haulage, and require constant attendance, especially for an overhead rope. The sets of tubs run on the inside track of rails along the curve, the other sets of tubs moving in the contrary direction on the outer track of rails are automatically released on reaching the curve, and continue their course to the end of the curve under the influence of gravity, the floor being suitably inclined to ensure this. Upon reaching the end of the curve the sets of tubs are again clipped to the rope. Fig. 15 shows this arrangement.

The curve proper for over-rope is made by building a brick wall along one side from the floor to a height, equal to that of the tubs throughout the extent of the curve. On the top of this wall rollers from 6 to 9 inches wide fixed in iron frames are placed 3 fet apart; they revolve horizontally and project beyond the brickwork to the centre of the rail track. The clips and the rope being above the tubs glide along these rollers all the way round the curve. The top flange of these rollers is of larger diameter than that of the bottom one, so as to prevent the rope from riding over and causing damage. Rollers with arms 6 inches long, one at each end of the curve, also prevent the rope from getting too high and out of its proper course. The other rope having no clips or forks atached to it is directed round the curve by means of large pulleys suspended from the roof.

For under-rope the best method for guiding the tubs round the curve is to construct it in a similar way to that for the main and tail rope with timber, but of

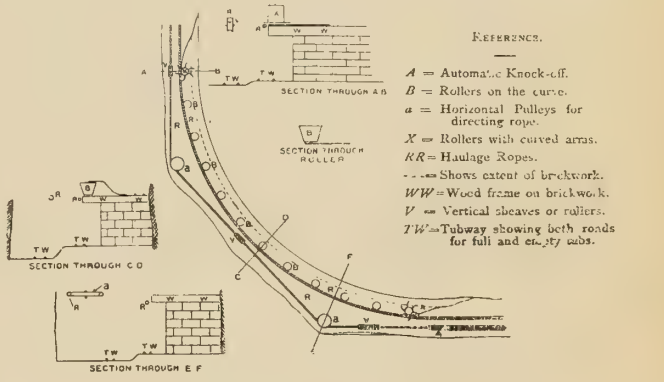


Fig. 15.

CURVE FOR OVER-ROPE.
ENDLESS ROPE HAULAGE

course having the two sets of rails, the outer rails being laid with a falilng gradient as described above, with 9 inch sheaves laid horizontally for the rope.

In both cases the descent of the road should commence 8 or 10 yards back before coming to the beginning of the curve. Small vertical rollers instead of drums, but fixed similarly guide the rope and clips round. The tubs travelling on the outside rails are released from the rope, gravitate round the curve, and are again clipped at the other end. It is necessary to have a boy at each curve to attend to the tubs and rope.

Bearing-down Appliances or Rope Guards.—These are necessary in undulating roads, having alternating dip and rise gradients. In endless over-rope haulage means must be adapted to prevent the rope at points of change in the gradient of the road from springing upward to the roof, thereby disconnecting itself from the tubs either by pulling out the forks or clips or by leaving them, and from scrubbing against the roof or timbers, which might otherwise happen owing to the stress upon it; more especially when hauling up pronounced changes of gradient.

This is effected by suspending a large beam or a revolving drum from the roof at the points of change either of which prevents the rope from unduly rising.

The beam is about 6 feet in length, 12 inches in width, and 3 inches in thickness. One end of the beam is hinged to a girder close to the roof, the other and lower end having a 3 inch diameter roller fixed on its under side is suspended by means of a chain from a balk of timber next the roof, and is weighted sufficiently to overcome the stress of the rope and cause the roller to press on it at one end and the hinge at the other allows the beam to adapt itself to slight oscillations of the rope. (*See Fig. 16.*)

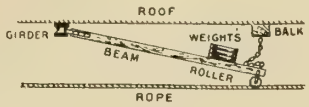
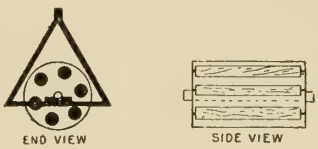


Fig. 16.

Bearing-down Beam.

At the bottom of drifts, a few yards inside of the point where the full tubs are clipped, a drum 2 feet in width, 18 inches in diameter, having six small parallel rollers within it arranged with a point in their circumference flush with that of the drum, revolves vertically just above the tops of the tubs. This keeps the rope down and also allows the tubs to be attached thereto. Sometimes two drums are used, there being a few yards distance between them. On engine planes which have small undulations the use of bearing down appliances may be dispensed with if the road can be levelled by taking up the bottom, or by ripping the roof and filling up hollows in the floor. (*See Fig. 17.*)



Showing Rollers.

Fig. 17.

Bearing-down Drum.

Only jockey clips or forks are trustworthy in use with bearing beams; these clips slide along the underside of the beams and lift them without themselves being disconnected from the tubs.

Methods of Tightening Rope.—In the endless rope system, the single rope used is, as the name implies, endless, passing round pulleys at the extremities of the engine plane without being fixed thereto. Now all ropes are more or less elastic and will stretch more or less according to the stress put upon them by the engine or load; and when the rope stretches, unless means are

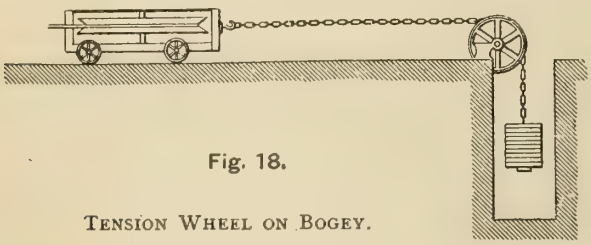


Fig. 18.

Tension Wheel on Bogey.

taken to prevent it, the driving wheel loses its grip upon the rope coiled round it, and revolves without giving motion to the rope. Consequently, tension bogeys, or wheels or weights, are used for taking up the slack from wear, and so keeping the rope tight. The best tightening appliances act automatically.

Tension Bogeys.—These are generally, but not necessarily, put at the inbye end of the haulage road, where they not only serve the useful purpose of maintaining tightness of rope but at the same time also act as return wheels. A tension bogey is made by fixing a pulley wheel in size from 4 to 6 or more feet in diameter, so as to revolve horizontally on a travelling carriage which may be gauged to run on the tub track. It may be placed either overhead for over-rope, or underneath the floor of the road for under-rope, in which latter case it is, of course, securely boarded over. This carriage usually runs on ordinary tub wheels, but in some cases

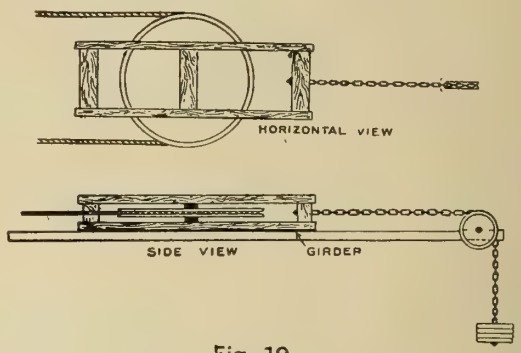


Fig. 19

Tension Wheel on Girders.

slides on a pair of girders of sufficient length to allow the bogey to travel 5 or 6 yards, the haulage rope being coiled 1 1-2 or more times round the bogey pulley. Attached to the inner end of the travelling carriage is a rope or chain which, after being led over a small pulley, is heavily weighted. The weights are sufficient to keep the bogey tight at all times causing it to move forward so as to take up any slackness of rope. (*See Fig. 18 and 19.*)

Screw Wheel.—Sometimes tightness of rope is maintained by means of a tension-screw, one end of which, after passing through a thread in a frame A, is attached to the pulley-carriage B as shown in Fig 20. When the hand-screw C. is turned, the tension-screw is drawn through the frame, and the carriage B may thus be moved forward for a limited distance, determined by the length of the tension-screw. This is not a good tightening plan as it does not act automatically, and therefore must be constantly watched and regulated by

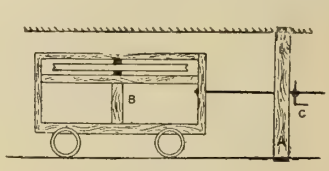


Fig. 20.

Screw Tension Bogey.

an attendant at intervals of time demanded by variations of the rope. Moreover, it cannot be used for a greatly increased length of rope without the appliance being taken down and re-fixed in another position.

Pulleys.—Where the stress upon the rope is not very great, a simple method of maintaining its tightness is by means of a tension pulley arranged as shown in Fig. 21. The rope A is led over the two fixed pulleys B and C, which are each 15 inches in diameter, and under the sliding pulley D placed between the two fixed pulleys. The sliding pulley is free to slide upward and downward in a frame, and has weights E suspended from it

which, under normal conditions, keep this pulley below the level of the fixed pulleys. The exact difference of level is a means of measuring the amount of rope-stretching. It is obvious that when the rope has stretched

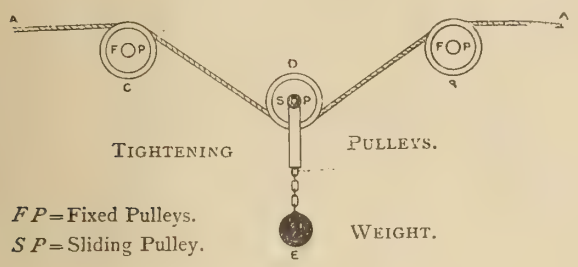


Fig. 21.

TENSION PULLEYS.

sufficiently for the weights to reach the floor this method of tightening becomes inoperative unless provision for their further descent is made by excavation.

ENDLESS ROPE HAULAGE FOR SINGLE ROAD.

In a mine having a bad roof, great difficulty is experienced in carrying wide roadways. It is impossible to introduce an endless rope system of haulage for a double line of rails. In this case a short double siding may be made at both ends of the haulage road, the two being connected by a single line of rails. The tubs can be run in sets of six or more, depending upon the quantity of coal to be despatched from the district and the distance and gradients of the road. The sets are run in a manner similar to that of the main and tail system, but with a continuous rope, and an inward and outward simultaneous travel is impossible. The ropes are carried on rollers underneath the tubs. The two ropes can be made to travel between the rails forming the track with separate rollers for each, the tubs being attached by means of clips, bogey clips being preferable. But in this method separate bogey clips must be used for ingoing and for outgoing sets, one being adapted for use at each side of the road, the inward and outward moving portions of the running rope being about a foot apart and equi-distant from the centre of the roadway. A clip set on a bogey therefore to grip the rope travelling in a particular direction is not applicable for gripping the same rope moving in the opposite direction.

Sometimes in endless single road haulage the rope for the full sets of tubs is carried on rollers in the middle of the tub track and the tubs are attached to it by means of a lever or screw clip, the return side of the rope is carried by the side of the roadway on sheaves and the empty sets of tubs are attached to it by means of a side fork. But in this arrangement there is always danger of the empty tubs being thrown over and derailed.

POSITION OF HAULAGE ENGINE.

Endless Rope.—In endless rope the engine is sometimes erected on the surface and sometimes in the mine, the adoption of the site depending upon local circumstances. Where steam is the motive power and shafts are not above 100 fathoms deeps, then the best position for the engine in on the surafce, with the rope securely boxed in where carried down the shaft. A good compound condensing engine on the surface, fitted with a governor, strong enough to do the work required of it, cannot be rivalled by any expensive electric motor, except where all the engines minus the winding one is driven form a generating station. The weight of the ropes in the shaft 100 fathoms and under is not calculated to exert too heavy a strain on the engine, and where the driving pulleys for the main roads—all connected on one shafting and driven by the shaft rope—are fixed in a suitable position and out of danger, this arrangement cannot be improved upon.

Where it is a deep shaft, then the engine should be placed in the mine close to the shaft, and driven by electricity. The connecting cables between the surface dynamo and underground motor being securely armoured and fixed to the shaft sides.

By this method no heavy ropes are in the shaft, the engine is placed most suitably for its work, and no inconveniently-placed driving pulleys are in the onsetter's way.

Friction clutches of any good make are necessary for disconnecting the driving pulleys when required. whether they be placed at the shaft and worked by the shaft ropes, or are fixed on the main shaft of the underfround engine.

Main and Tail Engines.—For main and tail it is always best to have the engine in the mine close to the shaft, and driven either by steam or electricity, the latter being preferred.

An objection to placing the engine on the surface is that the rope must of necessity be boxed-in in the shaft, consequently, with a high speed haulage, the confined ropes play havoc with the boxes, and in a very short time the continual hammering of the ropes either dislodge or break them, so that they will unless carefully watched for early signs of deterioration fall down the shaft, causing damage to or stoppage of the pit. Even if no injury were thus caused the rope works noisily in the boxes, and in the very place where quietness is most desired—at the shaft bottom. For signalling purposes, too, it is better to have the engine in the mine than on the surface, and placed close to its work.

For depts of 60 fathoms or less steam can be taken down the shaft to the engine without much trouble and without much loss of pressure, provided the pipes are well covered with some good non-conducting material, the only difficulty being that of dealing with the exhaust steam, which is usually conveyed by means of pipes into the upcast shaft. This difficulty is the greater if the upcast shaft is at a considerable distance from the engine. Electricity is the best motive power for an underground engine for main and tail haulage where the shafts are deep, there being no trouble in having the engine and motor in the mine, with heavily-armoured cables in the shaft.

ELECTRICITY FOR HAULAGE.

Electricity has been successfully applied for haulage, especially in the endless rope system. Both continuous and three-phase currents can be used. The former is the better and easier to deal with, especially if the engines are well designed and large enough for their work; there is certainly a liability of its commutator sparking and becoming dangerous, but underground haulage engines are rarely if ever placed in gaseous situations. If it should be so then three-phase motors are the better to adapt as they do not spark, but these are more complicated, and their factor of efficiency is not so high as with the continuous current. But whichever electric system is adapted a much larger margin of power must be provided for than if steam were used, owing to extra strains being put upon the motor when accidents happen to the sets of tubs.

Conclusion.

After thoroughly considering the two systems of haulage and all that may be said for and against them, the writer who has had a great deal of practical and varied experience with both systems and modifications of them, and frankly admitting a preference for main and tail owing to its simplicity and economy has come to the following conclusions as to the circumstances under which he would put in either one or the other.

Where only one or two main haulage roads are to be set away from the shaft in different directions to be driven for some distance, say a quarter of a mile or more inbye before opening out into branch roads, and have still to be extended to considerable distances further in to win large areas of coal, he would in all circumstances put in main and tail.

But where a coal drawing shaft is situated somewhere in the centre of the royalty and with three, four, or more haulage roads radiating from it in different directions, then provided the roof would allow of a double line of way, he would put in an endless rope system, with over-rope where the roads were level or nearly so, and with under-rope where the roads were greatly inclined or undulating.

SMELTER SMOKE, WITH A DISCUSSION OF METHODS FOR LESSENING ITS INJURIOUS EFFECTS.

(Written for the "Mining and Scientific Press by L. S. Austin.)

Anyone accustomed to smelting conditions as they formerly existed in the Western States, is astonished to learn that at the Freiberg smelting works in Germany, which treated but 70 tons of ore daily, complaint was made of the detrimental effect of smelter smoke, and the Government required sulphuric acid works to be erected at the expense of the smelter in order to get rid of the sulphur fumes. In the early experience of silver-lead smelting in the West, oxidized ores only were treated, and later when some roasted ore was added to the charge, the amount of sulphur was relatively small. The matte that was formed was heap-roasted and the smoke from the matte piles, practically containing sulphur dioxide only, caused little complaint. Sometimes the smoke would have a blighting effect when the wind was right for it, and the atmosphere was smoky to the leeward of the piles. Later, as the sulphide ores increased in quantity, they were roasted in hand or machine-rabbled reverberatories, and the fume was discharged from a stack, and thus became so diluted that it was not detrimental to vegetation. With the construction of large works treating thousands of tons of ore, the problem has greatly changed. The commonest ore of copper is chalcopyrite, which for proper self-roasting should contain (as much of it does) 25 to 35 per cent. sulphur. This is not the only drawback. At certain works not only is there sulphur dioxide, but arsenic, to contend with. While the latter cannot be called detrimental to vegetation, still it is poisonous if it falls in sufficient quantity upon vegetation which is to be used for forage. Again, the solid particles, or so-called flue-dust, falling upon the leaves of plants, may seriously injure them. The production of these substances is as follows:—

In both lead and copper blast furnaces the blast, coming up through the charge, makes a good deal of dust, and this in part settles in the flue that leads from the furnace to the stack. The velocity of the escaping gases is, however, too great to permit the settling of the finest particles. In the case of lead furnaces some lead is volatilized and upon cooling, a portion of it condenses upon the surfaces of the flue. The amount of SO_2 produced in lead smelting is not more than 0.2 to 0.5 per cent. The fumes from a copper blast furnace are different in constitution. They contain whatever arsenic has existed in the ore, and sulphur dioxide varying from 0.9 to 2.5 per cent. (At the Washoe plant, Anaconda, it amounts to 1.5 per cent.)

The fumes from roasters are largely SO_2 (up to 2.5 per cent.) produced by the burning of the ore, together with some dust caused (in the case of the McDougall roasters) by the fall of the ore from hearth to hearth, to the agitation due to the rabbles, and to the draft through the furnace. This dust settles in the flue leading to the stack.

In the case of reverberatory furnaces the charge is dropped upon the hearth in a body, so that comparatively little flue-dust is made. Some SO_2 develops as the result of certain reactions, indicated by the frothing or bubbling of the charge as it is melted. At the Washoe plant the percentage formed was 2.08 during the first ten minutes after charging. It drops to 1 per cent. during the succeeding 80 minutes of melting. Ebaugh gives the SO_2 as being but 0.01 per cent., but this must be after the early reactions, and from furnaces where the charges are much more slowly treated.

The smoke, upon leaving the stack, is more or less dissipated according to the velocity of the wind. In still weather it rises rapidly and seems to be carried away at a great elevation. With a moderate breeze it rises slantingly, but fills the air to leeward, while in a high wind part of the smoke will come to the ground at the base of the stack. And thus by this threefold action of the aerial forces, the upward-driving gases in calm, the buoyant but drifting smoke clouds in a moderate breeze, or finally the tumultuous energy of the gale tearing them apart, so that in any case they are dissipated and diffused through a mass of cubic miles of air, all contribute to act intermittently only upon a given area of the soil, so that relief comes to the harrassed vegetation, that it may make fresh effort to resist the next oncoming attack. It can be estimated that at one mile away, allowing 1.5 per cent. as being present in the escaping gases, the dilution (and not counting diffusion) will be such as to give 20 parts of the gas in a billion air.

Prof. Ebaugh has published an article in the Journal of the American Chemical Society, July, 1907, entitled "Gases Against Solids, an Investigation of the Injurious Ingredients in Smelter Smoke," and thinks that "too much emphasis has been laid upon the injurious effect of SO_2, and too little upon the harmful action of the solid

constituents (flue-dust)." He finds the blighting action is greatest in wet weather, least in dry. The losses of crops are not total but partial, and vary from year to year.

Analyses made for SO_2 in the air at distances varying from one to seven miles from the smelting works showed no gas in 60 per cent. of some 500 cases examined:—

60 per cent. contained no gas
12 per cent. contained 1 part of SO_2 in a million
20 per cent. contained 2 to 3 parts of SO_2 in a million
6 per cent. contained 4 to 6 parts of SO_2 in a million

leaving 2 per cent. of cases in which were found 7 to 10 parts of the gas in one million parts of air.

Upon passing air containing 1.5 per cent. of SO_2 over water to the point of saturation, the water at 90 degrees F. took up 0.33 volume of the gas per volume of water, and proportionately less as the air was weaker in gas. There is therefore but little chance of the gas when dissolved in water acting injuriously.

Hazelhoff and Lindau, German authorities, give the following conclusions regarding the action of SO_2 and SO_3 on plants:—

(1) No injury results to the soil nor to the roots of plants.

(2) The gases act by contact on the leaves of plants, and analysis shows that the sulphuric acid content is greater than in smoke-free plants.

(3) The sensitiveness of plants to such action varies with the species and with individuals which may show special immunity (white pines are susceptible, while post and white oaks and red maples are very resistant. Between these come black, red and black-jack oaks and yellow and scrub pines.—Haywood).

(4) Sulphur dioxide, even a few parts in a million, will with long continued action, produce an injurious effect on vegetation. Commonly such action is intermittent and so, less harmful.

(5) The gas acts by wilting the leaves, spots appearing and the leaves eventually turning brown or black and dying off. The SO_2 is probably converted to H_2SO_4 by the oxidizing effect of the leaves having thus a corrosive action upon them.

(6) The action of the gas is more injurious by day than by night.

(7) The action of the gas is cumulative, hence annual plants should be less injured.

In regard to the flue-dust itself, a sample of such dust, taken from the top of a stack, contained as follows:—Moisture, 4.1 per cent.; SO_2 soluble in water, 17.7; total SO_3, 33.9; Fe soluble in water, 3.6; total Fe, 16.7; Cu soluble in water, 1.6; total Cu, 4.2; SiO_2, 28.5; PbO, 8; AsO, 13; ZnO, 15 per cent. This analysis indicates the presence of soluble and insoluble sulphates. Such flue-dust is hygroscopic, taking up water in a saturated atmosphere as follows:—Original H_2O, 4.23 per cent.; after 12 hours, 10.21; after 24 hours, 12.05; after 48 hours, 13.09 per cent. The corrosive power was roughly proportionate to the hygroscopic power. Dust, mixed with water, and sprayed upon sugar beets and alfalfa, showed severe corrosion. If, however, the dust was mixed with soil to the extent of 10 per cent. or less of dust, the corrosive action was small; with 20 per cent. dust in the soil the action was severe.

Thus the finely divided dust or fume from either copper or lead smelting works is extremely corrosive in its effects upon vegetation. Prof. Ebaugh finally concludes: "By no means is sulphur dioxide to be considered harmless, especially in an enclosed place and a moist climate, but we are forced, by the weight of evidence, to the conclusion that heretofore undue influence has been laid upon the injurious effects of sulphur dioxide on growing plants, and that the solid emanations from the smelters, the so-called flue-dust, has been seriously under-estimated."

Haywood in an article entitled[1] "Injury to Vegetation and Animal Life by Smelter Fumes," says, in reference to the presence of arsenic at the Washoe plant, Anaconda: "Ores there treated contain in three instances As 0.51 per cent; As 1.17 per cent.; and As 2.54 per cent."

He found upon the leaves of plants which were to be used for forage:—

Bunch grass, 2 miles north of smelter, 78 parts As in a million.
Red top, 4 miles northeast of smelter, 21 parts As in a million.
Bunch grass, 3 miles east of smelter, 32 parts As in a million.
Bunch grass, 6 miles west of smelter, 42 parts As in a million.
Alfalfa, 10 miles northeast of smelter, 52 parts As in a million.

This corresponds, on a ration of 20 pounds daily, to from 3 to 11 grains of arsenic. However, it does not follow that this amount of flue-dust remains upon the grass, since because it is soluble to the extent of 90 per cent. and upward, rains may remove it, and particularly in harvesting, because of the frequent handling in curing, hauling, and stacking, the larger part of the dust would be shaken off the hay before it was fed to the cattle.[2] We may conclude, therefore, that in those localities where smelters do injury, farmers should adopt the soiling or stall-feeding system.

The smelting companies have been compelled by the troubles they have had with farmers, to cast about for methods of avoiding these difficulties, and have worked out the problem in different ways. As I have elsewhere stated, the farmers may be divided into three classes:—

First, those who do not feel they are damaged.

Second, those who honestly believe they are.

Finally, those who, while they do not believe it, make claims for the money there is in so doing. In Germany, for example, damages have been collected by cultivators, who have set out their grounds with expensive ornamental flowers unsuited to the climate, and which have no chance of prospering, in order to profit by damages for destruction by smoke.

The remedies that have been proposed may be thus enumerated:—

(1) Manufacturing the SO_2 into sulphuric acid to be sold as an article of commerce.

(2) Operating the smelting works in a barren country where the fumes will do minimum damage.

(3) Roasting the ore where the country is barren, thus removing most of the sulphur (to 10 per cent. or less) from the ore, then treating the roasted ore at a works convenient to labor and supplies.

(4) Roasting the ore at a works convenient to labor and supplies, discharging the resultant SO_2 by a high stack, then smelting the roasted ore, but filtering the fumes from this last operation by means of a bag-house.

(5) Filtering all fume resulting both from roasting and smelting.

(6) Introducing plants and animals best suited to withstanding the fume; adopting stall-feeding in place of grazing.

(1) This method may do well where there is a sufficient market for the sulphuric acid produced by the works. However, a large part of, say, 1,000 tons of ore daily would produce acid in excess of any probable demand. Besides this, only such SO_2 as was produced in roasting could be utilized, while the fume and flue-dust from the smelting would still do injury and would have to be filtered out.

(2) This was adopted at the Garfield plant of the American Smelter Securities Company, at Garfield, Utah, 18 miles from Salt Lake City. The land, especially in the path of the prevailing winds, was brought up by the company, which then proceeded to the erection of an expensive plant for the treatment of copper ore. The fume was removed by a stack the top of which is at a level some 600 feet above the works. The fume is thus diluted before it can touch land beyond the acquired portion. In a way, the experiment has proved to be an expensive one, since the company has been obliged to build a town for housing the employees; and at this distance from Salt Lake City, it is hard to get good labor, as well as hard to keep it. It is true that the company obtains a profit from its investment in the houses and in its town, but this is not the line of business into which it had intended to go.

(3) This method has been proposed where there are existing works that, because of the large amount of sulphur fume produced, have been serious offenders. If the ore can be roasted near the mine, for example, where the land is not used in agriculture, the damage becomes comparatively trifling, and the work of roasting requires but little labor. The operations of smelting and of converting the product can then be conducted where supplies and skilled labor are available.

(4) Prof. Ebaugh's experiments go to show that SO_2 gas alone may not cause radical injuries to plants and certainly not to animals, provided it is free from flue-dust. Indeed, according to Merrill's experiments[3] in the smelter zone, with stock properly fed and cared for, the animals flourish quite as well as elsewhere. If then the SO_2 gas from the roasters is allowed to escape freely into the air, it means that the main bulk of gases is thus disposed of. An ore containing 30 per cent. sulphur can thus be reduced to 7 per cent. If we smelt and convert this roasted ore, we may easily filter the small volume now remaining to be handled as referred to in method No. 3.

(5) At the American Zinc Works, near Canyon City, Colorado, the company has for years filtered all the gases from their roasters and blast furnaces, the latter being purposely run to make all the zinc and lead fume possible. These gases are first cooled to the proper temperature, both by passing through sheet metal flues and by the admixture of fresh air, then having been filtered at the bag-house, there is no smoke visible. This is also true of the bag-house installed in connection with lead-smelting plants. Where works thus provided deliver visible smoke, it is that coming from the roaster stack. Even this can be filtered, but it is a more difficult problem, the bag-house needing to be fitted with the more expensive woollen bags, which stand the attack of the corrosive sulphates and sulphuric acid, and small as is the quantity of them produced, cotton bags would be readily corroded. Still, even in large works, all the fumes can be filtered. By so doing, not only the flue-dust but the arsenic can be god rid of. The flue-dust collected in the "pits" at the bottom of the house contain a large percentage of arsenic, and such flue-dust is to be sent away where it may be safely treated, or the whole product buried, thrown into an abandoned shaft, or otherwise got rid of.

(6) It has already been shown that there is a great difference in the resistant power of plants to the fumes, and this power varies both with the species and with individuals. Especially where the land is owned or can be controlled by the offending smelting company, it should be good policy to plant those species of trees most resistant to the smoke. Forage plants should be selected in the same way and cattle should be stall-fed, rather than be permitted to pasture upon them. Root crops, as sugar beets, should be raised, since while the leaves of these plants may be damaged, it will not be to the extent of preventing a profitable growth of the plant. As far as the forage plants are concerned, the damage to the leaves varies, and is often so slight as to make little difference in the value of the plant for fodder.

In conclusion, we may consider the findings of the Master in Chancery, Oliver Crane, to whom was referred the matter of damages due to smelter smoke from the Washoe plant. He finds that the farmers had been somewhat damaged by the arsenic, but not by the SO_2 contained in the smoke. He says that an injunction and the closing of the smelters would damage the farmers and the community more than a continuance of the nuisance complained of; that the company had been doing what it could to avoid damages, and that the smelter is built on a site where it will do less damage than any other available place, and that the company has always been willing to pay some damages.

References.

[1] Journal of the American Chemical Society, July, 1907.

[2-3] "Feeding Experiments with Forage Grown in the Smelter Zone." *Western Chemist and Metallurgist*, April, 1907.

TECHNICAL EDUCATION AND THE FEDERAL GOVERNMENT.

At the annual dinner of the Engineering Society of Queen's University, Dr. W. L. Goodwin, in the course of a vigorous speech, suggested some ways in which Federal assistance could be extended to the cause of technical education. Dr. Goodwin took care to point out that, if control of the educative system is left with the Provincial authorities, there is nothing in the British North America Act to prevent such assistance being granted. Further, the speaker demonstrated that already the need and the principle have been recognized in the establishment of Federal agricultural, forestry, marine, biological and other similar stations. These may be fairly described as institutions for the advancement of science and scientific education.

The following excerpt from Dr. Goodwin's speech bears upon the above points and contains a series of very important and useful proposals:—

"It is natural that our particular interest should be in the advancement of scientific education. In this, Canada has made and is making great strides; but I doubt if she is keeping pace in this respect with industrial expansion, growth of population, and applications of science to industries. There is no general system of technical education of the secondary grade, there are very few attempts at trades schools, and even the higher scientific education is left to a few universities, most, if not all, of which are undermanned and insufficiently equipped. Some of the Provinces are doing their best to

meet the situation; but under our constitution Provincial revenues are not very elastic, while the Dominion revenues grow with the increase in the wealth and population of the country.

"It would seem then that this is an occasion for some Canadian Colbert—some far-seeing stateman—who will inaugurate a complete system of Dominion aid to scientific and technical education. There is nothing in the British North America Act to the contrary, provided control of the educative systems is left in the hands of the Provinces. Control is one thing—aid is another. That the principle has been already recognized is shown in the existence of the various Dominion agricultural, forestry, and other stations, which are really a means of scientific education, and are recognized as such, particularly in the case of the marine biographical stations. I venture to suggest some of the ways in which Dominion aid could be extended:—

"1. Grants to Provinces or municipalities for the establishment and maintenance of trades schools, or grants to existing schools to extend and improve them.

"2. An experimental forest in every Province, with station and staff, available for professors and students of all universities.

"3. Extension of marine biological stations, so as to include more of our coast waters and great lakes—permanent stations, with hatcheries and abundant opportunities for scientific investigation.

"4. Grants to universities and scientific schools to sustain research fellowships and professorships, and to maintain certain technical departments, such as standardization of instruments, standard testing of wheat, flour, etc., and the departments of practical science, as they are of general value to our country's industries."

THE ECONOMIC DISTRIBUTION OF ELECTRIC POWER FROM BLAST FURNACES.

By B. H. Thwaite, Assoc. M. Inst. C.E. (London).

Although in numerous papers and articles contributed since 1894, and in his evidence given before the Royal Commission on Coal Supplies, the author has reiterated the statement that blast furnaces should be made as far as possible the source of power for manufacturing industries situated within a certain area of such furnaces, it has always been realized that where such blast furnaces were associated with steel works and rolling mills there was until last year an unfinished link that prevented the full chain of possible benefits from being completed, in the fact that the heavy rolling mills had not been electrically harnessed.

Fortunately this unfinished link has at last been forged, for which thanks are due to the enterprise of continental electrical firms. To those who strive with more or less strenuousness for the prevention of waste of fuel and of power, and the reduction of the incubus of dead charges on working costs, the successful solution of the problem of harnessing electric energy for driving heavy rolling mills is a fact of great economic significance.

The heat and power efficiency of existing rolling mills is deplorably low. The associated steam boiler plant necessary to satisfy the maximum requirements of a rolling mill operation and the effect of condensation in steam pipes means a heavy thermal loss.

Before the date of the actual proof that blast furnace waste gas could be directly converted into power with an expenditure of 70,000 to 80,000 British thermal units per indicated horse-power hour (equivalent to a reduction of as 10 is to 30 compared with a good steam power plant), the waste of energy involved in ordinary rolling mill plants was a matter of indifference, because the waste of heat about balanced the supply—indeed the power available from the blast furnace gases had often to be supplemented by coal; but now that it is realized how valuable, as a power agent, this gas has become, the waste of fuel is morally and financially inexcusable.

Unlike the blast furnace (which may work steadily on, year in and year out, without week-end or other stoppages), the rolling mill may or may not remain steadily employed: a paucity of orders may mean the closing down of the mill for weeks, because, although pig iron may be stocked with little or no risk, it is not usual to stock mill products which may never be wanted. During this non-operating period the blast furnace gas used for firing the steam boilers is set free or blown into the air. This waste of fuel may be cut down considerably, if not entirely, by the application of the pooling system to be described, which involves the displacement of steam by gas power. Modern gas power electrification methods will set free a great volume of gas which, thermo-dynamically converted in a gas engine, will increase the power equivalent of such gas by 300 to 400 per cent.

The objection that is advanced against the gas-power electrification of the rolling mills relates to the heavy expenditure involved in such a technical reform. The objection is a real one, and unless removed or reduced, will tend to confine the advantages of application to firms of immense financial resources. Few British joint stock administrators would be permitted by their shareholders to risk the investment. But if it can be shown that for some iron-making concerns it will be possible to reduce the capital investment to the amount necessary to provide the equipment of the new rolls with electric motors, as distinct from the electric generators, and that such an investment will be financially well justified, the objection standing in the way of such electrification will be considered, even by the most cautious and conservative of managements, as of no deterrent consequence.

The author's proposal, first suggested in 1894 and 1898, repeated at different times since, and again to be described here, would, as an incident, secure a substantial reduction of the expenditure of a complete electric equipment of an iron and steel works, so as to cover all power demands.

The basis of this programme is to pool the waste furnace gases from all the furnaces of an iron-making district independently of the ownership of such furnaces. The energy (electrically transformed) of the different furnaces would be transmitted to a central distributing and transforming station, in which the current would be

transformed to the voltage to satisfy different customers. Of course there may be cases where the furnaces are so concentrated as to justify the delivery of the furnace gases to a pooling or central station for conversion into electrical energy, but usually it would be found to be more practical to transform the gas into electrical energy on the site of the ironworks, for transmission to a distributing central station. (See Fig. 1.)

The first call on this power would of course be the satisfaction of the internal demands of the iron and steel works, the balance of power remaining being available for external distribution over a wide area, the extent of which, owing to the familiarity with and knowledge of the resources and safety of high pressure transmission systems, is being yearly increasd. When the author put forward the first long distance electrical transmission project of over 100 miles in 1892, the line pressure then suggested was considered dangerous in the extreme; to-day, power is being easily and profitably transmitted over varying distances at very much higher pressures

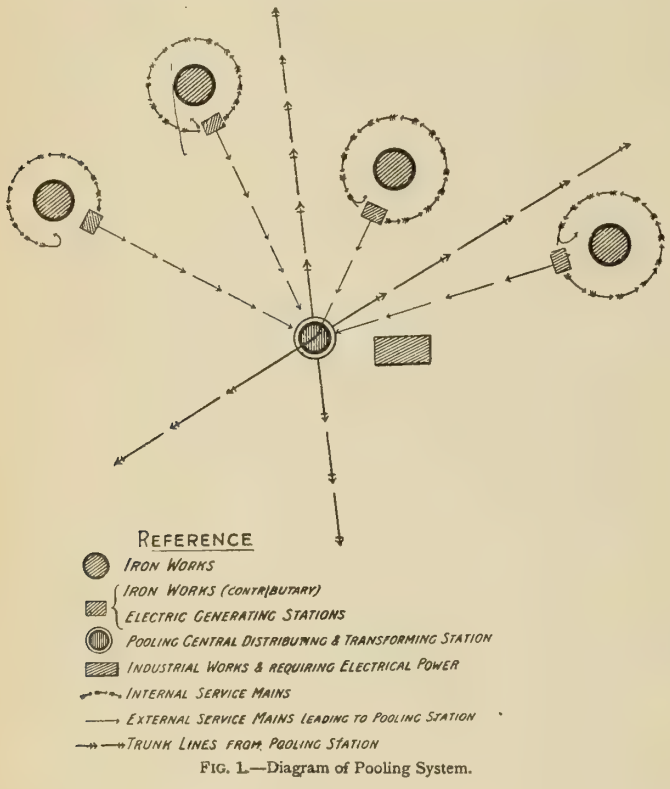


FIG. 1.—Diagram of Pooling System.

than those suggested in 1892. In 1892 the pressure specified was 20,000 volts; to-day, transmissions of 250 miles with 88,000 volts pressure are in daily service.

The pooling programme proposed would be provided by a separate and distinctive joint stock electric power organization, on the lines of the county electric power companies, which sprang from the author's 1892 proposition, with the exception that a proportion of the output is preferentially allocated to the satisfaction of the power demands of the iron and steel works from which the gases are drawn. The balance could be transmitted to any group of customers whose power demands justified the cost of distributing mains and associated transforming stations, but a more appropriate field of demand for an all-the-year supply would be the satisfaction of the electric energy requirements of the many profitable electro-chemical and electro-fusion processes described in the author's paper read before this Institute at Glasgow in 1901.[1]

Included amongst these processes, in which the demand for power would correlate with its production at the blast furnace, or from January 1 to December 31, there are the production of high class steel from selected scrap, special alloys, such as ferro-silicon and ferro-titanium, ferro-chromium, besides the production of carbides (silicon and calcium). Some of these processes could take the current just as supplied, in large or small proportions, and at any moment, so that the levelling up of the load or the demand could be readily effected—obviously an important factor in the economic production and sale of electricity.

In the selection of the customers it would be advisable to secure the class of demand for operations such as mine pumping, electrolytic and like processes, on which the supply could be turned on or off whenever available, so that the distribution of the current could be arranged to fill up any gaps in the demand.

As an example of the kind of power demands that would be found in an average field of industrial operation surrounding iron works, exclusive of the municipal and rural demands for current for lighting and tramway power purposes, the following is given to represent a German district for which the pooling system was first outlined by the author:—

	Electric Horse-power.
For the coal mines in the district.....	1,300
Chemical (metallurgical) requirements	2,500
Electro-chemical requirements	1,500
Works and town electric lighting	500

In large districts, the power-driving requirements of the factories would provide a demand running into thousands of horse-power, although the direct driving of important machinery will secure a great saving of (and consequent reduced demand for) power compared with belt driving and its associated power losses. The satisfaction of electric transport power requirements is becoming an increasing factor both for water and rail transport services. By this pooling system the tall stacks of the furnaces would become centres from which would radiate the benefits of the cheap power; and the advantages would be reciprocal. Besides removing the many smokestack polluters of the atmosphere, the additional profit would increase the stability of the iron industry in this country.

The flexible demand for power which it would be the aim of the power organization to secure would be appropriate for the intermittent periods of mill idleness, whether temporary or prolonged; for instance, the sudden release of power for external services at the week-end periods of mill idleness (or during longer periods of compulsory idleness due to the falling off or cessation of orders) would be available for one or other of these flexible power demands.

(To be continued.)

Mr. E. Jacobs, editor of the "B. C. Mining Record," recently visited the Tyee Copper Company's smelter, at Ladysmith, B. C., where he reports, extensive improvements, including additional ore bunkers, increased wharfage facilities and the installation of new machinery, are being made. The proposed doubling of the smelting capacity of the works will probably be undertaken ere long. The recent additions and improvements, were meanwhile designed by Mr. W. J. Watson, manager of the smelter, and the plans drawn by Mr. George Williams, mechanical engineer, of Victoria.

MANCHESTER GEOLOGICAL AND MINING SOCIETY.

At the meeting of the Manchester Geological and Mining Society, held on Tuesday, November 12th, in the society's rooms, 5 John Dalton street, Manchester, the newly elected president, Mr. James Ashworth, C.E., delivered his presidential address.

He spoke in part as follows:—

"My address will be rather as a mining man than as a geologist. The various matters relating to the regulations and working of mines are too familiar to you to require anything in the nature of a review from me. We can still congratulate ourselves that this country continues to hold the first place in respect of regulations for the safe working of mines. This point was conceded at the recent Miners' Congress at Salzburg. I am, however, afraid that the proposal of the Belgian representative at this congress, 'That coal production should be regulated by international laws,' will not prove a very workable proposition, although it secured the moral support of most of the delegates. It is also worthy of note that King Edward has created a new medal for gallantry in mines and quarries. The warrant states that the King is 'desirous of distinguishing by some mark of our Royal favor the many heroic acts performed by miners and quarrymen and others who endanger their own lives in saving or endeavoring to save the lives of others from perils in mines or quarries within our dominions and in territories under our protection or jurisdiction.' The new medal will be of two classes, to be designated 'The Edward Medal of the First Class,' in silver, and 'The Edward Medal of the Second Class,' in bronze. This indicates his Majesty's great interest in the efforts made to reduce the danger and the death roll in collieries, and such encouragement has been applauded and approved by everyone connected with mining.

"Mining men in this country are in many cases looking anxiously for the report of the Commission now taking evidence on the safety of mines. The subjects of rescue apparatus and the best treatment of coal dust, continue to excite the keenest interest, and a preliminary report on the first subject has already been issued. It is to be feared that far too much is expected to result from the apparatus, the cheapest of which is very expensive. Up to now there does not apear to be more than one instance of the saving of the life of a miner by this class of apparatus, and this occurred in an Australian mine at Bonnieville. Doubtless, rescue apparatus will be found of great advantage in the case of gob fires and other similar occurrences underground, but it seems curious that a simple, inexpensive apparatus called the Denayrouse, which was introduced into the country many years ago, was not brought before the present Commission. On the general subject of rescue work in mines it seems to me that a great deal more might be done by the Home Office in apportioning a considerable sum of money per annum for scientific investigations, which would materially tend to increase the safety of the persons engaged in our great industry.

"With respect to the attitude of capital and labor, I think you will have noticed there is a strong desire growing up amongst all sections of the community that courts of arbitration should be formed to settle industrial disputes rather than having to resort to the barbarous practice of strikes. This point was very clearly brought out in Mr. Enoch Edward's speech at Southport, when he strongly suggested the settlement of disputes by means of reason and conciliation rather than striking first and adopting reason and conciliation after.

"The Miners' Eight Hour Day Bill will probably become law during the next session, and although the conclusions of the Parliamentary Committee make light of the assumed loss on production of 25,783,000 tons calculated on the output for 1906, it is not denied that considerable loss will inevitably follow the adoption of such a measure, and many other expedients are suggested for mitigating the effects of the proposed reduction in the time underground. The employers' remedy lies apparently in the extended use of labor-saving machinery —coal-cutting machines and conveyors—and in the improved mechanical equipment of the mines generally. The committee admit that certain temporary and permanent relaxations of the rigid rule might be found necessary in the interest of safe working, and that the conditions are variable to such an extent that the special regulations would be required for certain districts. From many of these conclusions it is clear that the operation of law will not remove all the intricacies of the existing systems, and a hard-and-fast limit of working time will be found detrimental to the industry, both from the point of view of the employer and that of the employed. And further, is there not some reason in all these considerations for the feeling (that many of us have), that these processes of restriction, this law-pervading atmosphere dominating our industrial and social life, is destroying in our race and nationality that individualism, that spirit of self-reliance and of self-restraint which, beyond doubt, have had much to do with the industrial as well as the national development of England? We move in days of big combines and trusts, where everything is done by concerted moves, and where, except in a few brilliant instances, personality is submerged and operations are performed mechanically. The danger I apprehend is loss of character by the reduction of the personal element in our undertakings, and if we look upon our national industries not merely as means whereby men may rapidly and selfishly accumulate wealth, but also as means of intercommunication of sympathies and goodfellowship between capital and labor, which after all should be one of the principal motives of our commercial aims and pursuits, the danger to which I refer becomes a live one and one which philanthropic capitalists might well direct attention. We cannot be unmindful of the service rendered by the workers in the days when legal ties and binding clauses were almost, if not, quite unknown, and when labor was performed from a sense of duty sufficiently strong to keep the worker at his post and assist in the wonderful development that has characterized modern English history.

"Let us for a moment reflect on the great and rapid change made in England by the coal-miner. Has he not completly revolutionized our land and turned a large part of an agricultural country into a huge workshop. Only one hundred and fifty years ago Lancashire was the poorest country in England, and the most sparsely populated. To-day if you take an area of 50 miles round this room you enclose a population more dense than any other part of the world. You may liken it to one big workshop built on a coal hole. The miner has mainly effected this change. This change has brought with it many problems, and one is tempted to ask whether some of us have not lingered too long on the slopes of the Pennine Chain? Is there any outlet for this congested population? I venture to think there is; but it is not in Old England, but in New England be-

yond the sea—a land that covers one-fifteenth of that of the the world, and yet has not a total population of London to-day. I refer to Canada. It seems to me that the miner would do well to turn his attention more assiduously to this vast dominion, for in my opinion it will prove to be one of the most solid and enduring jewels in the British Crown. It is a happy omen that the 1908 summer meeting of the Canadian Mining Institute is to be held to some extent under the Government auspices, and promises to be a most important one and worthy of the best representation from this country. It is for us, and especially the younger amongst us, whose field of observation is widening out, to mark, learn, and inwardly digest every phase of mining activity, every fresh means adopted to meet a particular contingency, and to apply the beneficial result of their observations to the work in hand. In order to acquire this experience, it is absolutely necessary that fresh fields should be sought and appropriated; the situation is one which should have a peculiar attraction for the young mining engineer or colliery manager, whose steps should be directed towards new fields, where his energy can find full development. Could he have better prospects than in Canada? After every visit I have paid to this vast dominion, I have returned more impressed with its possibilities, and if I can only arouse your interest, I feel sure that you will agree with me, that Canada is the country of the future, for our surplus population, and that the Lancashire man, especially the miner, will do well to give it his serious attention."

Grouping Nova Scotia, New Brunswick and Prince Edward Island together as Acadia, or the Land of Plenty, the president said:—

"Of all the numerous British colonies, this region presents the strongest family likeness to the Mother Country, not only in the singular variety of its resources, but also in its proximity to the markets of the world. Gold, which excels in purity that of Australia and Califoria, is found here. It is here we have unequalled fisheries, safe harbors, extensive coal fields near the water's edge, and, above all, a position almost midway on the very highway between the Old and the Pacific side of the New World, and I am one of those who believe that Acadia will inherit a full share of that greatness which Britain in her old age must resign. Though it cannot be said to have yet attained the prosperity predicted for it, this region is to-day by no means an insignificant contributor to Canadian wealth, for of the total number of miners engaged in Canada, 42 per cent, find occupation in Nova Scotia. Coal is the staple mineral, and the Cape Breton, Cumberland and Pictou fields provide a fair proportion of the whole output. In Cape Breton coal is obtained in great qauntity from the Sydney and Inverness fields. The Sydney field was the first exploited, operations dating from the year 1785. In 1863 the output of coal for Cape Breton was 214,812 tons; to-day it is over 4 million tons. The other fields in this district of Acadia are responsible for a little more than a million tons, or a quarter of the Cape Breton output. The coal measures of the Cumberland area outcrop on the seashore, and have been worked extensively at the Joggins mines, where a seam of about 6 feet of coal has yielded an annual output of about 80,000 tons. The Pictou field, opened up in 1827, by the General Mining Association, is about eleven miles long, three miles wide, at its broadest part, and covers an area of about 22 square miles. Its structure presents many interesting features, and a few problems, some of which are—the remarkable thickness of the seams (in some cases 40feet); the extensive deposits of black and brown shale, the marked changes in these deposits noted at comparatively short distances; the nature of the dip —ever changing, but always considerable, and the numerous large and small faults intersecting the field at many points. The three coal producing districts of this field are the Albion, the Westville and the Vale. The coals vary in character, but are all the bituminous coking variety. Some tested at the Gas Light & Coke Company's Works, London, have yielded 10,450 cubic feet of 15-candle power per ton. Slack is valuable for blacksmith's purposes. The firey nature of the seams has necessitated the use of fans of large capacity and modern construction in place of underground furnaces. Mueseler, Marsaut and other lamps have been in use for many years. Quite recently the local papers announced that the Dominion Coal Company, whose annual output is about 3 1-2 million tons, has a representative in this country busily seeking to enlist an army of 2,000 miners for their collieries in Nova Scotia. Lancashire, Yorkshire and Staffordshire men are preferred, it is said, as being more accustomed to the long-wall system, which is the system of working in this part of the Dominion."

The president proceeded to discuss the other resources of this district, and speaking of Ontario, he said that:—

"Extensive iron ore deposits are worked at the Helen Mine, Michipicoten, along the line of Kingston and Pembroke and Central Ontario Railway, and smelted at Sault Ste. Marie Furnace & Steel Works, and Port Arthur Ironworks. Twenty miles north of the famous nickel district, iron ore is also found in the Moose Mountains (rocks of Keewatin age), and a railway only is required to make the Canadian iron ore certain of admittance into all markets. The proportion of iron in the ore is 60 per cent. No coal had been discovered in this province until quite recently, when lignitic coal was found near Lake Abitibi. It is reported that a mineral smelting plant is to be erected near to Toronto, which would provide employment for 15,000 men, treating 1,400 tons of ore daily."

Going further westward he said:—

"Though primarily the granary of the empire, Manitoba and the North-West Provinces are not bereft of mineral wealth, as they are underlaid by rich stores of lignite—which is a useful fuel for the cities and farming scattered population. Saskatchewan and Alberta, the two new provinces, each have an area of more than twice the size of the British Isles, but only a very small portion of the rich arble land is as yet under cultivation, nevertheless in 1906 the population had increased from a few hundreds in 1890 to nearly 500,000. In Alberta there are inexhaustible deposits of lignitic coal. The principal developments of anthracite and bituminous coal have been made in the neighborhoods of Banff, Frank and Coleman, and to a smaller extent between Calgary and Edmonton.

"Considerable deposits of iron ore have been discovered in Alberta, and this suggests an industrial as well as an agricultural future for this district."

Other districts in Canada were mentioned as fields of enterprise, and the president passed on to speak of British Columbia as offering great attractions to the miner, and in conclusion he urged the importance of Britishers not letting the control of any of these rich coal areas pass into the hands of Americans.

"I have now taken you," the president said, "across the continent, from coast to coast, and although we have quickly examined the localities of the most important minerals, a vast amount of exceedingly interesting in

formation on mining progress has necessarily been omitted. The principal object of my address is to endeavor to bring before your notice something of the immensity of the value of our Canadian possessions with a view to impressing upon you the importance of the direct investment of English capital into Canada, instead of though New York and other Stock Exchanges as at the present time, for the danger is that Americans wil secure the command, through capital, of the mining and other undertakings. If this country is to have and keep the controlling power, then it is essential that she should hold the purse-strings. The latest news from the famous Crows' Nest district, report huge beds of coal above the railway, and the Pennsylvania miner sees in this district—if the British speculator cannot—great beds of coal more than equalling the enormous deposits of his own State. There was, and is, a great truth underlying the remark made by the Prince of Wales in reference to his Canadian visit, that 'England must wake up,' otherwise she will fail in her duty to the Dependencies."

THE COLLIERY GUARDIAN.

"HUSTLING" TO "RECEIVERSHIP."

ALEX. GRAY, Montreal.

Were he not the chief of the coterie of London mining financiers, the remarks of Sir Julius Wernher at the annual meeting of Fraser & Chalmers, Limited, held in London on November 14th, might go unnoticed. Because he is the senior member of Messrs. Wernher, Beit & Company, and therefore associated with very great industrial enterprises and higher technical institutions of learning, his reflections invite serious consideration and rebuttal. He represents the investing and speculative public, is one of the life governors of De Beers, has large interests apart from mining, and possesses the confidence of bankers on the continent. Naturally, therefore, his utterances carry weight, and on this account it is as well for all now concerned that he unbosomed himself in thus explaining away a comparatively insignificant falling off in the net profits for the year of Fraser & Chalmers:—

"Their investment in the Allis-Chalmers Company remained, unfortunately, unaltered. He said, unfortunately, because the shares had had a heavy drop, and again there was no dividend. If things looked black for the moment in America, let them remember that in spite of everything that was happening there the country itself was as sound as ever. Speaking generally, it suited us on this side to crawl into moderate prosperity *than to 'hustle' into receivership.* He hoped, therefore, that the shareholders would not be altogether dissatisfied with the modest 10 per cent. and a sound financial position which the board offered them that day as the result of the year's work."

Whatever the relation be between the British section of the business originally conducted under the aegis of Fraser & Chalmers—the Canadian-American department being included in the Allis-Chalmers-Bullock Corporation—the inference is plain that Sir Julius deprecates trans-Atlantic methods and capitalizations. He was epigrammatic, and at the expense of those "hustlers," some of whom recently took over the City of Mexico street railway system, in which Messrs. Wernher, Beit & Company were decisive elements. There being no dividends, a rather unfair analogy was drawn between "hustling" and "receiverships," whereas the magnitude of Canadian-American undertakings is the soundest argument under the circumstances, why distributions should be deferred until the financial outlook is clearer. The "country is sound."

Without special knowledge of the position in corporate counting houses, it may well be assumed that huge capital commitments and inevitable credits do not make for dividends when currency is at a premium and overdrafts inaccessible on other than usurious terms. Undoubtedly the firm of Wernher, Beit & Company have never been heavy borrowers, their income from De Beers and kindred ventures yielding continuous returns; but Sir Julius should be chastened in spirit in view of the "hustle" manifested in the underwriting and distribution of mining shares and the prevailing market quotations for many of those shares. For this he is hardly at fault. He stands for the credit of the Witwatersrand Gold Fields and Kimberley Diamond Fields. When the Wernher-Beit "deep levels" were "hustled" into existence, six or ten years ago, without developments or dividends, "receiverships" were not thought of. When the Central Mining Trust was underwritten because it was sponsored by Wernher, Beit & Company, it was taken for granted by subscribers that the premiums they paid would be infinitesimal compared with the dividends they would receive. Instead of this there have been depreciations and writings off, and dignified disavowals therefor emanating from Sir Julius, whose entire career has been marked by honor and candor. When Rand "deeps" were promoted labor troubles and financial depression growing out of the South African, Russo-Japanese and American difficulties were not included in the list of possibilities, any more than the inability of the Westinghouse and Alils-Chalmers Companies to earn fancy dividends and suitably finance themselves in stressful times.

Sir Julius recognizes the impossibility of "hustling" governments into doing the sensible thing rather than precipitate thousands of holders of South African shares into the bankruptcy courts. His chief of staff in Messrs. Fraser & Chalmers, Limited, Mr. Walter McDermott, chose the more intelligent, and certainly more logical attitude, when he said at the same meeting—though before Sir Julius arrived:—

"Those who followed the great South African gold industry would have noticed that the producing companies were doing in the aggregate as well as, or even better than, ever before, but there was *little new enterprise for want of capital, and consequently orders for new installations were few and far between.* He was sure in his own mind that this would not last, and he quite shared the opinion lately expressed by a prominent South African that there were hundreds of millions of pounds worth of gold waiting extraction; that ore worth down to 5 dwts. and perhaps below would be found profitable to work, and to do so more machinery would be required, but it would all take time, and they must have patience."

No less distinguished as the ex-president of the London Institute of Mining, and a director of the Mines Selection, Limited, Mr. McDermott as a general manager of Fraser & Chalmers, Limited, touched the tender spot when he dwelt upon the scarcity of fresh undertakings owing to the "want of capital." In this instance the mining houses "want the capital," the machinery manufacturers find that "orders for new installations "are few and far between"; but there is no presumption that the "hustling" of share issues has the slightest relationship to "receiverships." Nor will there be occasion to requisition innumerable "receivers" on this side of the water. "Every month less progress," as Mr. McDermott expressed it. Whatever inflation there has been was not confined to Canada and America. More reor-

ganizations and amalgamations have been consummated, or are contemplated elsewhere, than may be necessary over here if there is less haste for recovery from present complexities.

Sir Julius must not depart from his role of "guide, philosepher and friend" to the greatest gold-getting industry the world has seen—or will see. South Africa will be all right. Canada is all right. The United States will be all right—when enough Witwatersrand gold has been drafted thence.

PRODUCTION OF ANTIMONY IN 1906.

By far the greatest amount of antimony produced in the United States from domestic ores is that contained in antimonial lead. During 1906 a production of 10,546 tons of antimonial lead, containing 1362 tons of antimany, was reported by the refineries of the country. It is estimated that about one-fourth of this was produced from foreign ores, so that the production from domestic ores was about 1021 tons. This quantity was about half that produced during any year for the preceding five years and was less than the trade requirements, so that metallic antimony was melted with lead to supply the demand.

Most of this antimonial lead was used in making antifriction metals, but it also finds use in storage batteries, for lining lead chambers in making sulphuric acid, and in making toys and coffin trimmings.

Antimony combines readily with many metals, from some of which it may be easily volatilized under the heat of the blow pipe. Antimony has the property of hardening lead when melted with it, and in the smelting of antimonial ores much hard lead is produced. Alloys of antimony and lead expand on solidifying and make excellent metal from which to cast type, since it will fill the corners of mould . Type metal contains varying quantities of antimony, generally less than 40 per cent., alloyed with tin, lead, and sometimes copper, zinc, bismuth and nickel. Britannia metal and pewter, formerly much used for table ware, are also alloys containing antimony.

Up to the present time the United States has been but a small producer of antimony, owing to the low price of the metal, to the distance of the known domestic deposits from market, and to the low cost of production from extensive deposits in other countries. Hence it has been only in times of high prices that the deposits in the United States could be worked at a profit; and although there is a constant increase in transportation facilities and the metallurgy of antimony is becoming better known, it does not seem likely that there will be much increase in domestic production in the near future.

The remarkable rise in the price of antimony which began in 1905 continued in 1906 and stimulated production greatly, but toward the end of the year the price fell. Sudden changes in price, however, have been common in the history of the antimony market.

DOMESTIC PRDUCTION OF ARSENIC.

Thousands of tons of arsenic are wasted annually in the fumes that pour from the stacks of the great smelters of the United States, yet notwithstanding this waste, or perhaps because of it, more than 8,000,000 pounds of arsenic and arsenic compounds, costing about $375,000, were imported into this country in 1906. The domestic production for the same period was only a little more than one-sixth of the quantity imported and was valued at but $63,460.

Arsenic ores are widely distributed, particularly in the granitic and highly metamorphosed rocks, and ores of tin, copper, and antimony are frequently accompanied by those of arsenic. Native arsenic, a tin-white brittle substance occupying a place midway between the metals and the non-metals, is found sparingly in veins at a number of places, but it is not important as an ore.

France, England, Germany, Portugal, Spain, Turkey, Canada, and the United States are the principal producing countries.

In the United States, and also in England, the great bulk of the arsenic produced is obtained from smelter fumes. English smelters are not allowed to pour arsenical fumes into the atmosphere, and compliance with the law gives added profit from the white arsenic saved. There are, however, but two smelters in this country that have plants for saving it—the huge Washoe smelter at Anaconda, Mont., and the smelter at Everett, Wash. A smaller plant, located at Mineral, Lewis County, Wash., makes white arsenic from realgar. The only other known arsenic production in this country in 1906 was a few hundred tons of arsenical pyrite mined at Pine Pond, town of Kent, Putnam County, N.Y., and this pyrite was shipped abroad. As ordinarily applied the term 'arsenic" means "white arsenic" or "arensious acid," or arsenic trioxide (As_2O_3). It is used as an insecticide in the preservation of hides and stuffed skins of animals and birds, in sheep and cattle dips, in arsenic soap, and as a wool preservative, where it also prevents fungoid growth. It is also used to prevent the growth of weeds and grass, in the making of some enamels and in the manufacture of glass, as a fixer or conveyer of aniline colors in calico printing, and as a constituent of the dyes themselves.

The greatest demand for arsenic is for making Paris green, used as a pigment and as an insecticide on plants. Its toxic effect limits the former use. In medicine arsenic is used as a tonic and it performs a similar office in various stock foods and medicines.

SULPHUR AND PYRITE INDUSTRY IN 1906.

The sulphur industry of the United States during the last few years has been characterized by steady growth in consumption, increase in production, and decrease in quantity and value of imports as a result of the development of domestic resources.

Statistics collected by Dr. David T. Day, of the United States Geological Survey, and published in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," show that the domestic production increased from 181,677 long tons, valued at $3,706,560 in 1905, to 294,153 long tons, valued at $5,096,678 in 1906. Exports amounted to 22,237 long tons, valued at $460,435.

The great production of sulphur in Louisiana continued in 1906, and the success of the Frasch sulphur process, by which the mineral is melted by streams of superheated water pumped into the Louisiana wells, has been fully demonstrated. Local demands for sulphur for sheep dip and for use in destroying vegetable parasites have been very well met by developments in Utah, Wyoming and Colorado.

The dominating factor in the world's supply of sulphur has been the production of the material in Sicily, which in 1906 showed a large decrease, chiefly due to the loss of the American trade through the development

of the Louisiana deposits. The exports from Sicily to the United States have decreased steadily for the last four years—from 155,996 long tons in 1903 to 41,283 tons in 1906.

The pyrite production of the United States increased from 253,000 long tons in 1905 to 261,422 long tons in 1906, but the price declined from an average of $3.71 per to nin 1905 to $3.56 in 1906, causing the total value to decrease from $938,492 in 1905 to $931,305 in 1906.

Pyrite burning entered significantly into the sulphuric acid business in 1882, when the product was 12,000 tons. In 1885 the product had increased fourfold; five years later it had nearly doubled again, and increase has since been rapid. The growth has been due not only to the cheapness of this source of sulphur but to the use of the cinder in the blast furnace. The dominant position in the pyrite supply is occupied by Virginia, and California and New York follow.

More careful attention to waste products in copper, lead and precious metal smelting will lead in the near future to a production of sulphuric acid in such quantities as to affect commercial conditions very appreciably, and these sources of the acid must be taken into account.

EXCHANGES.

The "Mining Journal," London, November 16th, touches editorially upon the evolution of the State Trust and applies its conclusions to the tin industry of the Federated Malay States. As the "Journal" points out, that industry is in the hands of small Chinese operators who are incapable of surviving the loss entailed by suspension until the market improves. "Trust must be fought by Trust, and if there were anything in the Malayan idea that the United States Steel Trust were still operating against the tin market, they could argue with some force that as the Administration had previously intervened to protect the country against the Trusts' smelting designs, consistency required that it should do so again against their bear operations. Meanwhile, the idea of State interference will become more familiar, and in proportion as financial experience and strength becomes more centred in a few hands, the demand for Government control or reprisal will certainly grow, and may even form the basis of the international struggle of the future."

The "Mining and Scientific Press," November 23rd, presents a paper on "Smelter Smoke, with a Discussion of Methods for Lessening its Injurious Effects," by L. S. Austin. This article we have pleasure in reprinting on another page and in discussing in our editorial department. Another article by Mark. R. Lamb on "Sliming Ore for Cyanidation" is timely. "It is not so certain from the present outlook that the sliming of all ore is generally advisable or even passible . . . However . . . it is possible, even easier, to treat and wash sand by agitation and vacuum-filtration than by leading. Sand cannot always be filtered successfully on vacuum-filters . . . Air-lift agitation has solved the problem of cheap and effective agitation of either sand or slime, but from the fact that fine grinding will increase extraction it does not follow that the entire mill product should be treated as slime. When it can be so treated such a plant is, of course, ideally small, self-contained, inexpensive, and easily operated.

PERSONAL AND GENERAL

Mr. M. L. Elliott, manager of the North Cobalt Silver Mining Company, left last week on a visit to England.

Mr. O. B. Perry, general manager in the Yukon for the Guggenhein Companies, has returned to New York for the winter.

Mr. S. Beanland, of the Boston-Richardson mines, Isaac's Harbor, N. S., has returned from visiting his home in England.

Mr. W. Knott, the discoverer of the Reddick mine at Larder Lake, died at Dorset, Ont., on the 21st ultimo, as the result of a gun accident.

Mr. O. S. James, consulting chemist for the J. E. Wilkinson Company and for the British American Smelters Limited, is conducting a series of experiments.

We learn, with regret, that Mr. Hiram W. Hixon, for many years past general manager of the Mond Nickel Company's mines and works, at Victoria Mines, Ont., is leaving Canada at the end of February next.

Mr. W. O. Gilman, operating an hydraulic mine in the Cariboo district, B. C., has returned to Boston, with the intention of arranging early in the spring for the equipment of the mine with suitable machinery.

Mr. D. W. Robb, president of the Robb Engineering Company, of Amherst, N. S., is at present in the West. After staying for a few days in Victoria he proceeded to San Francisco and other points in California.

Mr. Alex. McNeil, who has been actively associated with mining in Nova Scotia, as president of the Dominion Antimony Company and other enterprises, has left Halifax and will in future reside at Washington, D. C.

Mr. R. H. Sweetser, superintendent of the Algoma Steel Company's blast furnaces at Sault Ste. Marie, leaves shortly to assume the duties of superintendent of the Columbus Iron & Steel Company, Columbus, Ohio.

Mr. W. J. Prisk, until recently manager of the Dominion Antimony Company's mine at West Gore, N. S., is, according to the "Industrial Advocate" about to assume the direction of the Consolidated Gold Mines' property at Moose River.

Mr. E. A. Collins, of Hatten & Collins, consulting engineers of Webb City, Missouri, passed through Toronto on his was to Trenton, Ont., on the 7th December. Mr. Collins is a mining graduate of Queen's School of Mining.

It is reported from Vancouver that the Standard Oil interests have bonded a number of copper properties on Queen Charlotte Island, the claims having been recently examined and reported on by Mr. S. C. Chisholm, the company's chief engineer.

Mr. W. F. Jennings, of Sydney, C. B., has completed a tour of the mining districts of Nova Scotia, and is now engaged in preparing his report for the Mines Department at Ottawa on the mining and metallurgical industries of that province.

At the fifth semi-annual dinner of the Canadian Camp, held at Hotel Astor, New York, Dr. Robert Bell, chief geologist of the Ottawa Survey, was the guest of honor. Dr. Bell's entertainers were a group of men prominent in letters, finance and public affairs.

Mr. T. H. Wilson, chairman of the Tyee Copper Company, has arranged to go out to British Columbia and supervise the business of the company temporarily, pending the appointment of a successor to the late managing director, Mr. Clermont Livingston.

Mr. C. A. Molson, a Science Graduate of McGill University, and a Logan Gold Medallist, was accidentally shot and instantaneously killed near Salt Lake City, Utah, on November 24th. At the time of his death Mr. Molson was acting as engineer for the London Exploration Company.

Mr. E. P. Colley, a well known British Columbia land surveyor, has just returned to Victoria for a season's work in the Ootsa Lake country, where he was in charge of surveys for the Provincial Government. Mr. Colley speaks in very enthusiastic terms of the rich resources of this area.

Referring to the recent close down of the Granby mines and smelter in the Boundary District, Mr. J. P. Graves, managing director of the company, expressed the hope that the suspension of operations would be very temporary, but added that it was impossible for the company to produce copper at the present market price.

The nineteenth annual dinner of the students of the Faculty of Applied Science, of Toronto University, was held on December 6th. The guest of honor was President Falconer. Among the speakers were President Falconer, Dean Galbraith, Professor A. T. De Lury, Mr. T. W. Gibson, Acting-Dean Ellis and Mr. C. H. Rust. Nearly four hundred attended the function.

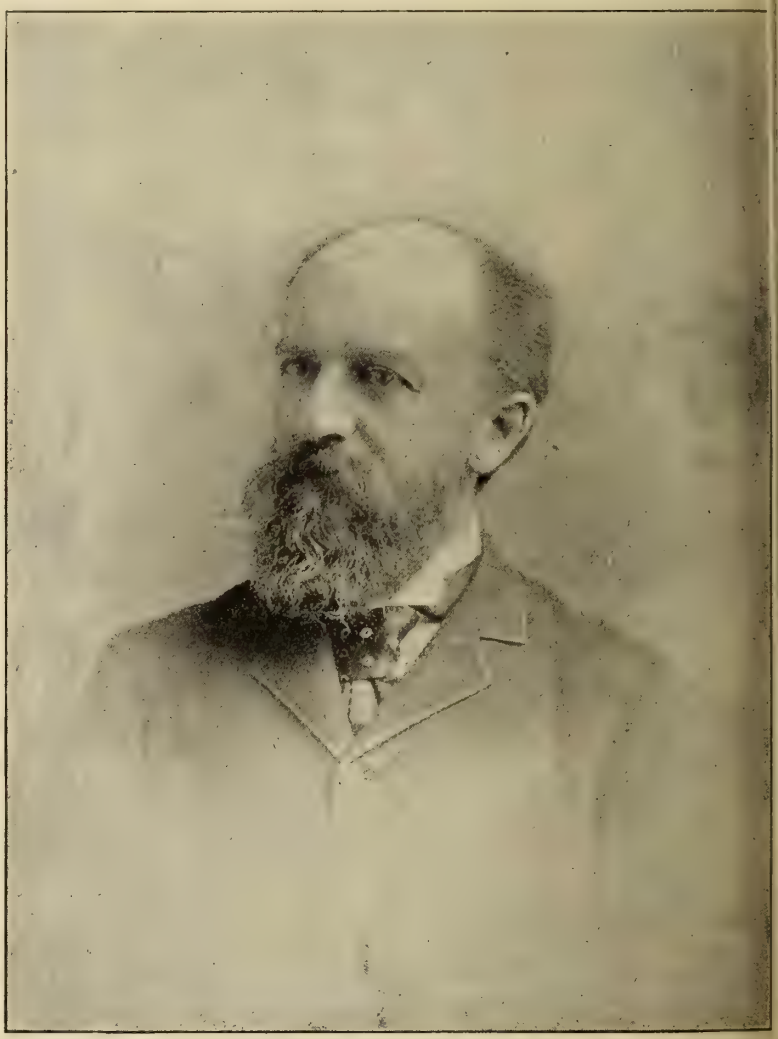
Mr. H. L. Clarke has ben appointed mechanical superintendent of the Dominion Coal Company's No. 1, 5 and 10 mines; while Mr. A. Stewart has been appointed to a similar post at Nos. 3, 4 and 6 collieries, and Mr. R. J. Bell for District No. 2. The appointments of Mr. John Maxwell to the management of Nos. 2 and 9 collieries, and Mr. B. Connors to No. 4 are also announced.

Mr. Louis Katona, a Hungarian metallurgist, commissioned by the Austrain Government to report on the mining industries in the leading countries of the world, is at present in British Columbia. In an interview he expressed himself as very favorably impressed with the mineral resources of Canada, but added, that he considered only the surface had to the present been scratched. He was especially interested in the electro-metallurgical experiments at Sault Ste. Marie, and stated that the copper smelters in the Boundary district were the most up-to-date plants he had seen, and that Canadian metallurgical practice was far in advance of that of Austria or Hungary.

The annual dinner of the Engineering Society of Queen's University, was held on the evening of December 6th, in Grand Hall, one of the magnificient new buildings of the University. The dinner was a success in every respect. The various students committees are deserving of much praise for the way in which all arrangements were carried out. Among the guests of the evening were Deputy-Minister M. J. Butler, Mr. J. B. Tyrrell, Mr. Frank Loring, Professors MacLeod and Porter from McGill, and Mr. J. C. Murray, editor of the Canadian Mining Journal. In addition to these gentlemen there were representatives from the University of Toronto, from McGill and from the Royal Military College. An innovation was introduced in respect to the hour of beginning. The guests were all invited for 6.30 p.m. The annual dinner has been made a dignified and important occasion. The students themselves indulge in no unseemly manifestations of animal spirits. The whole tone of the dinner is one of dignity and good fellowship.

OBITUARY.

The death occurred on the 29th ultima, at Montreal, of Dr. Bernard J. Harrington, professor of mineralogy at McGill University. The late Dr. Harrington was born at St. Andrews, Que., in 1848. He entered McGill as an undergraduate in 1865 and four years later graduated with first class honors in Natural Science, winning also the Logan Gold Medal. He then went to Yale University to study chemistry, mineralogy and metallurgy, and there took his degree as Doctor of Philosophy. Dr. Harrington was appointed lecturer in chemistry and mining at McGill University in 1871, but resigning the post at the end of the year, for seven years acted as chemist and mineralogist to the Geological Survey of Canada. In 1883 he was appointed professor



of Mining and Chemistry at McGill University, a position he held to the time of his death. As a writer of scientific subjects, more particularly in the domain of Canadian mineralogy, Dr. Harrington was well known. During his long and useful career he also held offices in many technical organizations. For many years he was president of the Natural History Society of Montreal, and editor of "The Canadian Naturalist," now published under the title of "The Canadian Record of Science." In 1897, he acted as vice-president of the Chemistry Section of the British Association at Toronto. In addition to his academic degrees, Dr. Harrington was a Fellow of McGill University, of the Geological Society, and of the Royal Society of Canada, and of the American Chemical Society.

CORRESPONDENCE.

The Editor,

CANADIAN MINING JOURNAL, Toronto, Ont.

Sir,—Regarding my article, "A Method of Mine Surveying," in your issue of November 15th, please note the following corrections:—

Column IV line 10 should read "foresight read from vernier still using side telescope"

In Fig II. $\Delta 110 - \Delta 111$ and $\Delta 111 - \Delta 112$ should be joined

Column IV paragraph 5 should read "The slope distance from centre of telescope at $\Delta 111$ to $\Delta 112$ and vertical angle being measured, the horizontal distance D_1 is calculated and the small angle $\delta = \delta_1 = \tan^{-1}\frac{d}{D_1}$, whence the azimuth $\Delta 111 - \Delta 112$ becomes

$$\text{Azimuth } (\Delta 110 - \Delta 111) \mp \tan^{-1}\frac{d}{D} + \text{deflection} \pm \tan^{-1}\frac{d}{D_1}$$

where d = the perpendicular distance between telescopes, the upper or lower signs being used when telescope is respectively to right or left of observer.

Yours truly,

A. B.

Vancouver, B.C., Nov. 27th, 1907.

Springhill, N. S.,
Nov. 21, '07.

To Editor MINING JOURNAL,

Sir:—In a late JOURNAL there was a letter from Mr. Robert Archibald, manager of the Eastern Coal Company, at Maccan, criticizing some remarks of mine concerning the value of the coal claims outside of the C. Rw. & Company, holding in the county. It was not my object to at all discredit the value of the mines in operation in any part of the country. Outside of Springhill, Mr. Archibald probably knows more than the writer does about the value, or otherwise, of other mines operating in the country. I had not these in my mind when writing of the value of the C. Rw. & C. Company holdings. I have some knowledge of the well equipped and well managed Chignecto Mines, also of the value of the Joggins areas, and the splendid work being done there by the present management. I know of the efficient management of the Fundy, Kimberly, Strathcona and Jubilee mines, as the managers of these several mines are all my friends and acquaintances. Leaving the question then where Mr. Archibald has placed it, and which I had no thought of doing, I also leave that gentleman his assumption of comparative values of all the mines, in quantity and quality. I must admit, however, that judging from the costly surface-plant of the mine of the Eastern Coal Company, of which I had a glimpse, there must be coal seams of unquestioned value on this property.

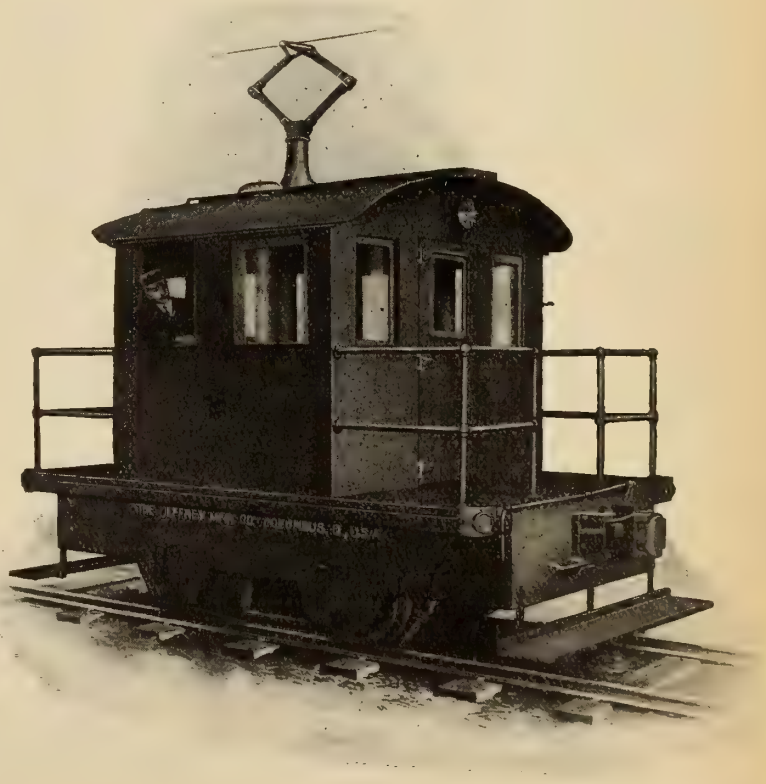
Yours,

W. D. MATTHEWS.

NEW MACHINERY.

The accompanying illustration shows a view of a 25-ton switching locomotive built by the Jeffery Manufacturing Company, Columbus, Ohio, for use in handling freight cars for the Cerveceria Brewery, of Monteroy, Mexico. This style locomotive takes the same electrical equipment as the mine type, the only changes being in the side and end frames and the addition of a platform and suitable cab to accomodate the conditions incident to surface work. The motors are of the water proof steel frame type having drum wound armatures, laminated pole pieces, oil lubrication with auxiliary grease boxes and liberal wearing surfaces.

These locomotives are built in sizes from 10 to 30 tons with two motors, and in larger sizes with three and four motors, arranged with rigid frame or with double trucks having flexible wheel base, depending entirely on the conditions.



SPECIAL CORRESPONDENCE

NOVA SCOTIA.

GLACE BAY.—The output of the Dominion Coal Company's mines for November is in excess of any previous November in the history of the Company, being 336,190 tons compared with 308,365 tons last November and 303,000 tons in November 1905. On the 28th. the collieries raised 15,457 tons which is the largest single day's output this year with the exception of any day in June. On the 27th, No. 2 shaft raised 4,659 tons for one shift's work, and maintained an average of over 4,500 tons a day for three consecutive days. We consider this is a noteworthy performance.

Thanks to the excellent outputs the Coal Company were able to rush shipments to Montreal before the close of navigation and succeeded in sending up almost 100,000 tons in November, which is another record for this month, beating the figures of 1902, which were 92,000 tons. The Coal Company shipped remarkably late this year, the last ship leaving Sydney on the 28th. This is at least a week later than any previous final sailing. Thanks to the open season and the outputs the company were able to catch up very markedly on their Montreal contracts and the shortage in shipments will be much less than was anticipated.

The Hub Colliery commenced to draw coal again on the 27th November, after being idle about eleven months. Reserve and Caledonia will in all probability go on single shift this week, but there will be no slackness of work this winter. The winter outputs in Cape Breton are steadily climbing up to the summer production, and the marked disproportion that once used to exist between them is gradually disappearing. What little difference now exists is due to local climatic conditions and not altogether to a varying market.

The Coal Company took a census of their houses recently and some of the information obtained is of interest. Despite the large influx of population the Cape Breton miner numbers 85 per cent. of the total. The total population dwelling in the company's houses is a little over 10,500. There are possibly 2,000 of the company's employees who live in houses not owned by the company. Altogether the population dependent on the mines is at least 15,000, independently of the population of Sydney, which is less directly, but none the less surely dependent on the Glace Bay mines. An interesting figure in the census returns is that of 88 widows, nearly all of whom are allowed to live rent free by the Coal Company, and are allowed a certain amount of free coal.

Several new residents arrived recently in the shape of Poles from Scotland. It is rather amusing to hear these men talk, speaking as they do with the broadest Lowland accent. Finding their names a little unpronounceable some of these men have adopted Scottish names, such as Adam Nelson.

The population around the collieries is growing very cosmopolitan. On the tramcars that run from Glace Bay around the collieries to Sydney, one meets very varied types of passenger. It is no unusual matter to see Frenchmen, Indians, Greeks, Poles, Russians, Jews, Belgians, Hungarians, Germans, etc., on the same car, and one would need to be a very accomplished linguist to understand the babel of language that ranges from Gaelic to Micmac from Lithuanion and Magyar to the dialogue of the Lancashire and Yorkshire collier and his comrade from the "wee kingdom." But, eventually they all bow to the supremacy of the English language, and the next generation will retain no remnant of their mother tongue, but will speak English as it is spoken in Canada, with no variation in dialect, from Vancouver to Scaterie.

The three years contract between the Dominion Coal Company and the Provincial Workmen's Association as representing the workmen of the Coal Company will expire with this year. The Coal Company approached the officers of the P.W.A., at the beginning of November, with a view to the renewal of the contract, which has worked to the general satisfaction of all during the past three years, and at a meeting on the 20th of November the general manager of the Coal Company definitely offered the P.W.A. the option of a renewal of the old contract on exactly the same terms as before, the option to expire in one week. In putting their views before the men the Coal Company stated that while in the face of the present financial stringency and the prospects of industrial depression in the near future, there were many cogent reasons why it was not good policy on the company's part to enter into another long term contract at the present rate of wages, yet they felt these considerations were outweighed by the advantages of such a contract in giving general stability to their business, and in enabling them to make long term coal contracts and ship charters, added to the fact that it removed many possible factors of disagreement between the company and their men. For these reasons the company were willing to renew the contract as it stood. The general manager stated that in case the men were unwilling for any reason to renew the old contract, the company were willing to negotiate for a new one with the provision that it must not involve any increase in the cost of mining coal.

These proposals were reported to the Lodges, which we understand all decided definitely to refuse to renew the old contract. At a meeting held on the 27th November, the men asked for an increase of 15 per cent. to all day labor, an increase of about the same percentage to mechanics, that the loaders in all the Phalen seam mines receive a uniform rate of 15 cents per ton, which is an increase of from 25 per cent. to 30 per cent, and that all miners out of places receive $2.44 per day, when on shift work until such times as places are available.

The men claim that their earnings have been reduced by the introduction of safety lamps and by the use of high explosives and detonators, which have been introduced in many sections in place of compressed powder and squibs, and by the system of company's shotfirers. They state that the mines are over-crowded with skilled labor, and that the native miner is being unfairly displaced by importations of European miners. The scarcity of loaders is also working to their detriment. They point out that the cost of living is much higher than it was, and that with the present price of the necessities of life the wage of the laborer is quite insufficient. The P.W.A. express themselves further, as being opposed to any contracts, preferring to work without, as under these arrangements they are precluded from taking advantage of any marked increase in the selling price of coal, and they would prefer to have their wages regulated by a sliding scale, having the present scale of wages as the minimum basis.

The company state that they cannot consider any general increase to mechanics, who they consider are well paid. The majority of the mechanics employed by the Coal Company did not come within the range of the old contract.

The company state that they cannot consider the rate of $2.44 for miners out of places. Such a rule they consider would be impossible to carry out, and they could not guarantee to find work for any class of men.

The company recognize that $1.38 is a small wage, but they point out that the majority of men getting this wage are drivers, or old men past active labor and practically pensioners. Many others earning this wage are unfit for more arduous or responsible work, being physically or otherwise unfit. There are very few men at this wage who are supporting families.

With regard to loaders the company have for a long time had difficulty in getting enough of this class to work their mines to the best advantage, and agree that the wages should be increased in order to make the work more attractive.

The management of the Coal Company have accepted the decision of the men not to renew the old contract as a final answer. The men take the ground that as they do not wish to sign any contract, they had no further proposition to make.

For some time passed labor conditions have been unbalanced at the collieries, and the company's officials contend that this is very largely due to the great disproportion that exists in the remuneration paid for the different classes of underground work. They maintain that some classes are overpaid and that others are very much underpaid, and further, that considerable difference exists between rates at different mines on the same seam under similar conditions, for which there is no adequate or real justification. In the early part of the negotiations for the contract of 1904, the general manager of the Coal Company expressed himself as being favorable to a readjustment of rates, which would remedy this unbalanced state of wages, but was not successful in getting his plan adopted by the men.

Under the circumstances above detailed the management of the Coal Company have decided that the time has now arrived when in the interest of all concerned, such an adjustment should be made, and they have announced their intention to the men to put adjusted rates into force by the first of next year.

The company propose to make an increase in the wage of the loader, making the rate such that he will be able to earn $2.50 per day with a fair day's work. They further propose to equitably adjust the various mining rates in rooms worked by machines in such a way that the net result will be a slight increase in the total cost of mining machine room coal, and to increase the wages of the labor, excluding drivers and boys. To compensate for these increases it is intended to reduce the tonnage rate in pillars, which are claimed by the company to be so attractive that they cannot get men for the other necessary operations of mining. The management claim that the effect of a schedule such as they propose will be to benefit all concerned, that it will remove the unfair disproportion in rates which has resulted in an overlapping of their organization, that it will render it easier to get and retain the services of loaders, thus guaranteeing steady work to the more skilled and higher paid miners. The company also ask for the abolition or at least considerable modification of yardage consideration in pillars, and an understanding that whenever it is in the opinion of the management unsafe to draw pillars by the use of powder, the man will take these out with maul and wedge without powder at the same renumeration and without any cessation of work until such time as the dangerous conditions are overcome. The company also consider they should receive a fair return for the powder supplied by them to their workmen, which at present is charged at several cents below cost. In future powder will be charged at cost plus 10 per cent. to cover handling, distribution and wastage, the men being given the privilege of purchasing their powder elsewhere subject to its quality being approved by the officials.

At present all the company's employees get their house coal at a reduced rate. The company claim they lose heavily on this account every year, and that with the increase of the resident population the burden is steadily growing. They therefore propose to ask for a considerable increase in the price of workmen's coal.

The schedule of adjusted rates is to be presented for the consideration of the P.W.A. Lodges at their meetings on Saturday the 7th, and it is anticipated the men will give their answer early in the next week.

Up to the present the conference between the management and their men have been marked by fairness and courtesy, and the arguments of either side have been considered without any heat or ill-feeling. For a considerable time past the relations of the Coal Company's management with their workmen have been very pleasant, and it is hoped that they will continue to be so. The company are asking for a reply to their proposals by the 16th of December, and in any case, whether a contract is arranged or not, the new schedule of rates will become effective from the 1st or January 1908.

SPRINGHILL.—The workmen of Springhill have made application for a third Board of Conciliation. Ignoring the finding of the Board in the first place, they came out on strike for what the Board denied them. While out on strike, and certainly not employees of the company, another hearing was accorded them by the chairman of the second Board. There were no representatives of the company present. Copious evidence was given by the workmen in proof of the justness of their claim. But, after all the evidence was in, even the astute Judge who acted as chairman, was at a loss what to do with it as the men were on strike and the settlement of the strike would be the settlement of all questions between company and men. The list of grievances summed up in this latter reference simply makes all concerned look most ridiculous in the eye of the public. In view of their treatment of the first Board, the men should in decency hesitate before calling another. The Government and the public generally must be greatly exercised over the sort of Board these people want. One man prominent amongst them complained that the first Board was too much like a tribunal of justice, there was no opportunity given a man to say all he wished. Those of the management who do not look upon the whole proceeding with contempt are amused over the situation as developed by the strike.

Weigh scales were placed in position during the strike, and the company have since been weighing all coal taken from the mine. No definite arrangement has yet been made as to the price per ton, but this will be easy of adjustment now.

It is announced that certain capitalists are negotiating for the purchase of the C. R. & C. Co's areas in C. B. Whether this be true or not, it is a well known fact that these areas ar the most valuable, unworked on the Island to-day, covering as they do all the seams of the Morien Basin, situated to the south of the Dominion coalfields and midway between the splendid shipping ports of Sydney and Port Morien.

NEW BRUNSWICK.

New Brunswick is proving richer in minerals than many people ever dreamed of. Magnetic iron ore at Lepreaux, a mountain of iron at Gloucester, copper at Letete, with here and there a promise of richer finds, have served to direct public attention to the mineral possibilities of the province.

Premier Robinson, who was in St. John recently, expressed the opinion that the smelter to be erected by the Drummond Mines Limited, for working the Gloucester ore, would be located at Bathurst. According to expert reports made on this property, the mineral formation in that section is remarkable and is unique in the history of mining in Canada. The property is some fifteen miles from Bathurst on the Nepisiquit River and within a few miles of Grand Falls. It is an outcrop of what promises to be a large seam. The ore can be uncovered on the side of the mountain and without the sinking of any expensive shafts.

The property is located at some distance from the more frequented districts and for this reason the existence of the deposit was unknown to many except interested parties. In consequence of this, two or three private parties were enabled to secure control of all the property they desired. The fact that mining can be carried on as in quarries, and without the immediate necessity for the sinking of expensive shafts and the construction of hoisting plants, will greatly cheapen the work and practically the only undertaking of importance in connection with the development will be a railway line of fifteen miles in length from the working to Bathurst. It is estimated that the Nepisiquit River is capable of supplying 10,000 horse-power, which will be much more than can be required in the mines.

Mr. J. J. Drummond, of Londonderry, N. S., was in St. John on Friday, November 29th, and, after a brief stay in the city went to Gloucester County to look over the iron deposits. He expressed his intention of conferring with Premier Robinson and T. M. Burns, of Bathurst.

The most remarkable thing about the deposit, in Mr. Drummond's mind, was the fact that it had not been discovered for

such a length of time. He considered New Brunswick to be practically unexplored, as far as its mineral wealth was concerned.

The exploiting of the iron deposits will be carried on during the winter.

Next summer the Government will begin the construction of the branch railway from Bathurst.

At a meeting of the New Brunswick Iron Company held on Saturday, November 30th, a resolution was passed authorizing the sale of 2,000 shares of stock at $25 each. This was the only thing done. Cash from the stock sold will be used for development purposes.

Information from Campbellton is to the effect that a rich gold discovery on the Jacquet River had been made recently.

It was stated that the Archibald brothers, who have been prospecting on the river all summer came upon a rich find on Saturday, November 25th. A confirmation of the report has not been obtained at St. John up to the present time.

It has also been learned that the mine owned by Dalhousie and Campbellton parties on the southwest branch of the Upsalquitch is turning out well. The ore is assaying about $50 to the ton. Workmen have now tunnelled about fourteen feet. When forty or fifty in they expect to strike the ore shoot.

BRITISH COLUMBIA.

FERNIE.—The output of coal from the Crow's Nest Pass Coal Company's collieries is steadily increasing, and it is estimated that before the end of the year, a million tons will have been been mined for the year.

There is at present another coke shortage, due this time to the fact that the smelters are not in a position to take coke, and the ovens at Michel and Fernie have been operating about half time for a month past. The Boards of Trade have not been conspicuous in a noisy effort to handle the situation, as they were three months ago. They are not now asking the Government to force the Smelters to take coke, so as to keep the laboring men employed, and the mines and ovens of the Coal Company working to produce coke, as they were in the summer asking the Government to give the smelters coke.

It will be remembered that in June last the smelters of British Columbia raised wages 50 cents a day inside and out, and in this way created a market for labor which left the Crow's Nest Pass Coal Company without men at their ovens, so that they could not produce coke. Copper was then 25 cents. Copper is now 13 cents, and the smelters and miners of British Columbia find it impossible to mine and smelt and pay that wage, so that they have decided to close down. The result is that having created a shortage of coke in the summer, by their action in raising wages, they have now created another coke shortage, so far as coke makers are concerned. by being obliged to go back to where they were in May last.

If anything were wanted to show the unfairness and unbusinesslike action of the smelters last July, after creating a situation in trying to take advantage of it to injure the Crow's Nest Pass Coal Company, and bring the Government to veto the exportation of coke to the United States, it is the present situation. If their policy had been effective, during their present shutdown the whole plant of the Crow's Nest Pass Coal Company would have lain idle, to serve their selfish ends, and until they got ready to again do business, by undoing the mistake they made last June in raising wages.

THE KOOTENAYS.—The local situation has improved a little since last writing. This is due to the acceptance by the Rossland mine workers of the wage scale that was in force prior to the raise in wages of July 1st, and to the fact, that it is highly probable that the Granby mines will begin work on the sixth of December; at least it is the intention of the mine management to resume operation, provided the miners will go back to work at the same wage scale now prevalent in Rossland and other prominent mining camps. The miners of the St. Eugene mine at Moyie are more or less discontented at the moment of writing, owing to the fact that the Board that is arbitrating their differences in Nelson on the twenty-seventh of November, maintained that it was impossible and unreasonable to accede to the demands of the mine workers. It is anticipated that the Rossland mines will now be able to work along smoothly until general conditions are more favorable, and it is hoped that the Boundary people will get together and that work will be started there as expected on the sixth instant.

As stated above the thing that attracted most attention in Rossland camp during the last ten days, was the question as to whether an adjustment of the wage scale, which is a large item in this camp, could be arrived at. On Tuesday the twenty-sixth ultimo, Rossland Miners' Union took a referendum vote on the question, the mines closing down to afford all the men opportunity to cast their votes, and the result was that a very large majority favored retrograding to the scale of wages paid previous to July first. In view of this manifestation the rate mentioned went into effect on the first instant, and at the present time seems to be very satisfactory all around. It is stated that if the men had not voluntarily come forth and declared themselves as they did, some of the mines here might have been compelled to close down until the prices of metals strengthened. Under the high scale machine miners received $4.00 per day of eight hours and shovelers got $3.25. With the scale in force two or three months previous to July 1st, and which is again in effect, machine men are getting $3.50 for eight hours and shovelers $3.00; other help around the mines has been correspondingly reduced.

The men employed in the Consolidated Company's smelter, at Trail, B. C., voted on the 28th ultimo on the reduced wage scale, and as in the case of Rossland a majority were in favor of returning to the scale in vogue at the smelter prior to May 1st, at which time wages were advanced there. The question was examined from different view-points by both Unions and many factors entered into the result of the vote, which I cannot go into here, in this short article.

For the week ended November 30th, Le Roi mine shipped 2,240 tons of ore, Consolidated mines 3,635 tons. Le Roi Two shipped 525 tons of good grade ore. This is a fairly good output, and if maintained or increased in the future will bear good fruit. A good deal of important development work is being done on Le Roi, Centre Star, Giant-California and other mines here. So far the results of this development have been very satisfactory.

Mr. Kiddie has taken charge of the Northport smelter, vice A. I. Goodell who has taken charge of the Sullivan property at Marysville.

Ore received at the Trail smelter during the week ended November 30th, amounted to 5,373 tons. The following mines are shipping to Trail: Centre Star, St. Eugene, North Star, Silver King, Arlington, Whitewater Deep, Ferguson, Standard, Ymir and several others, shipments running from 458 tons, in the case of St. Eugene, 68 tons North Star, to 18 tons in the case of the Ymir, taking the mines in the order named.

Since last report the shareholders of the Consolidated Mining & Smelting Company, of Canada, have received their checks for the last dividend declared. The total amount of dividends paid so far by this combination amount to $848,825.00.

Things have been very quite in the Boundary for the last fortnight. All of the big mines and smelters are closed down tight. There are only about a baker's dozen of men working around the Granby, B. C. Copper and other mines. They are mostly retained as watchmen. At the Consolidated Company's, War Eagle property in the Boundary, over 500 tons of coal have been stored away to be used until electrical power is available. The B. C.

Copper Company is installing a huge 42 x 43 Jenckes Crusher, and has an up-to-date Rand rope driven compressor on order.

Nothing has yet been given out as to the conclusions arrived at by Messrs. Melville and Johnson of the Dominion Copper Company, after their visit to the mines of the company in the Boundary district. A lot will depend upon the action of the Boundary miners. It is stated that the mine operators have gained some concessions in the way of reduced cost for supplies, and if the miners are anxious to see the mines start up at an early date and are willing to give their little aid, the low grads propositions of the Boundary will be able to work along even with copper at its present low price for a while.

For the week ended November 17th, ore shipments from the Granby, Snowshoe, Mother Lode and Emma mines, amounted to 28,403 tons. These were the only mines shipping that week.

The directors of the Granby Company have deferrerd action on the regular quarterly dividend. The B. C. Copper Company have done the same thing, and it is not known whether the dividend will be paid or not. The last B. C. Copper dividend was 25 cents per share, regular quarterly with 15 cents extra and was paid September 4th.

There are now fifteen blast furnaces cold in the Boundary district, the B. C. Copper Company having blown out their last furnace on November 26th.

The balance of the machinery for the Crescent mine has finally arrived after a long delay, and Supt. Feeney has started work on the property with a force of ten men. They have recently made a strike of silver bearing ore on the Crescent running about $120.00 per ton.

R. Robert of the Jewel mine has gone to Ottawa on business. There are twelve men now working on the property. They have about 2,000 tons of ore on the dump and the ore body continues from two to four feet in thickness. As soon as the snow covered roads are in good condition for heavy hauling, some of this ore will be shipped to the smelter.

The lessee of the old Cariboo-McKinley mine have suspended operations for a while. It is said that the Providence mine will shortly resume work. The Strathmore, Fremont and E. P. U. mines are working steadily. The decline in the price of copper has not affected these high-grade silver properties the way it has the copper propositions.

There are a large number of men out of employment in the Boundary. In addition to the mining men who are idle, there are about seventy-five Hindus out of work, now that the farm products have been harvested. Unless these Hindus find work the Boundary people will have a small Hindu problem on their hands this winter. Numbers of the mine workers have gone into the hills doing assessment and development work and quite a number of them have gone into the woods cutting ties, getting out cord-wood, etc.

Only about 100 men are now engaged in building the Great Northern branch between Keremeos and Hedley. It is expected that the road will be to Hedley by May next and into Princeton about the end of 1908. The Vermillion Forks M. & D. Company will install machinery some time next year, which will enable them to augment their output greatly. The coal of this vicinity is well adapted to domestic purposes and there seems to be plenty of it. A strike has been recently made on Bear Creek and at Collins Gulch the seam recently discovered measures eight feet. The platinum properties being worked on Champion Creek in the Similkameen are showing up well, where work is being done.

The Guggenheims have suspended work indefinitely on their property in the Cariboo country. It is stated that they are negotiating for a group of valuable claims near the well known Britannia group.

The Britannia mine is now closed down tight, no one being about the place but a watchman. As soon as the ore about the Crofton smelter is cleaned up this plant will also shut down.

The Cornell group on Texada Island has been sold to the Texada Consolidated Mines for a half a million dollars. The Gold Peak group of claims on Moresby Island has been bonded to Tretheway Bros. for $10,000.00. The Queen Charlotte Islands are very rich in coal, petroleum, gold, copper, silver and timber, and their resources will add materially to the future wealth of the already richly endowed provinces of British Columbia, as soon as they are opened up on a greater extent.

Nelson people have also bonded and are developing valuable Moresby Island copper properties.

The Western Fuel Company, of Nanaimo, has come to an agreement with their employees in the matter of wages, etc. The new agreement makes permanent the 10 per cent bonus recently granted. The Nanaimo mines are now enjoying the largest output they have known in their history.

The Tyee smelter has not been materially affected by the slump in copper and is still in operation. They are treating a high grade ore from a mine on Prince of Wales Island, which with the output of the Tyee and other custom ores is keeping them quite busy.

Another pulp mill proposition is being advanced on the Coast for a plant on Howe Eound. We trust that it will get on a little farther than the plans and specification stage and that the promoters, who are Vancouver people, will get the industry going in eight months, as they anticipate.

The Canadian Zinc Company, of Nelson, have their new electrical process zinc extractor nearing completion. A Nelson syndicate has just recently put up $10,000.00 to complete the plant. The proposition has been about four years under construction and has cost from sixty to seventy thousand dollars. Zinc ores from the Slocan and other zinc districts will be treated along lines familar to miners in Sweden. If this separator is entirely successful many of the Slocan mines now inoperative where the silver values are low and zinc percentage are high, can be worked at a good profit.

The 5,600 foot aerial tramway for the Hewitt mine was shipped from Nelson, where it was assembled and where part of it was manufactured, a day or so ago. The Hewitt people have just purchased 1,000 acres of land surrounding their property near Silverton. They have acquired this for the dual purpose of insuring themselves of a reliable source of timber for the future, and over which to run their tramway from the Hewitt number six level to the mill recently acquired from the Wakefield mines. They are negotiating for a compressed air plant and other machinery and it looks as though they meant business.. In sympathy with a similar move in other parts of this district wages in the Slocan have come down a little. The Porto Rico mine has been leased to a Spogane man and a force of six men put to work. Poplar Creek, the gold camp, seems to be coming into favor a little again. Considerable work is being done and some good strikes reported. Forty-five men are being employed at the Rambler-Cariboo mine. Capt. Tretheway has resigned from the managership of La Plata mine, on account of his health. He is leaving B. C. for the East. Mr. Tretheway will still remain a director of the company.

The Government has been asked for grants to aid in opening the upper Duncan country, which is rich in mineral and timber wealth. One of the companies operating in that section is termed the Consolidated Mining & Smelting Company, of British Columbia. This must not at all be confused with the Consolidated Mining & Smelting Company, of Canada, which is the Rossland concern.

The Sullivan Company at Marysville has just completed the installation of a third Huntington-Heberlein Roaster. It is the idea, however, of the Sullivan Company, to further explore the mines at Kimberly, at depth, before making any further addition to the smelter. As mentioned above in this report A. I. Goodell is now in charge at Marysville.

The St. Eugene arbitration board sat in Nelson on the 29th ulto. The men based their application for higher wages on the higher price of metals and higher cost of living. The company urged that there had been no material increase in the cost of living and that the high prices for metals no longer existed; further, that the St. Eugene miners were getting higher wages than those in Rossland, Butte and elsewhere. Next sitting of the Board will be held at Nelson December 19th, in the meantime there will be a conference held at Moyie.

The Aurora properties across the lake from the St. Eugene and in line with the submarine mine on the lake have been bonded by Moyie people. About $10,000,00 has been expended on development work up to dote.

Labor is now plentiful along the Crow's Nest Pass, but there is a shortage of coal cars. The Crow's Nest Pass Company pay-roll for October was $205,416. The provincial mineralogist has been investigating a huge crack in the mountain near Coal Creek. The miners feared a repetition of the Frank disaster. No danger is feared for the settlement of Coal Creek from this break in the hillside, however, as the conditions are not the same as existed at Frank.

Dec. 4th, 1907.

GENERAL MINING NEWS

NOVA SCOTIA.

PORT MORIEN.—The new North Atlantic Collieries, who have acquired the properties of the Gowrie and Blockhouse Collieries, Limited, are making especial provisions for sailing vessels and schooners, whereby they may be loaded with coal with a minimum of delay. Port Morien harbor, being safe, easy of access, and open for the major part of the year, offers inducements not to be obtained at more northerly sea-ports. The run of mine product averages less than 1.00 per cent sulphur and 2.50 ash.

SYDNEY.—The Dominion Coal Company is to ship through Portland, Maine, this winter 195,000 tons of coal, 130,00 tons will be transhipped through Canada and 65,000 tons will be used on the Grand Trunk.

It is reported that the Dominion Coal Company is to import 1,000 Polish and Slav miners between now and May 1st 1908. The men are to be chosen from those familiar with Scotch methods of mining.

SYDNEY MINES.—The Noca Scotia Steel & Coal Company's collieries had an output twelve hundred tons larger during November than during the preceding month.

The figures are as follows:—

Mine.	Tons.
No. 1.....	24,031
No. 2.....	26,387
No. 4.....	488
No. 5.....	7,374
Total	58,280

November output was exceptionally good since No. 4 was unable to ship coal on account of some unavoidable delays in construction work. Water is being rapidly taken out of the old No. 2 colliery.

Activity prevails in the othher departments of the company's works.

QUEBEC.

MONTREAL.—Dr. B. W. Harrington, Professor of Chemistry, McGill University died on November 29th. Dr. Harrington had been one of the leading figures in his profession for many years.

ONTARIO.

OTTAWA.—The appointment of R. W. Brock, Professor of Geology at the Kingston School of Mining, to the position of Acting-Deputy Minister and Director of the Geological Survey was announced on November 29th.

COBALT.—George Leyson, formerly manager of the Silver Queen, has been placed in charge of the Cobalt Central.

The Cobalt Central Concentrators are now treating over 80 tons of ore per day.

The T. and H. B. mine, it is reported, is to be sold at a satisfactory figure to an English syndicate.

The Silver Bar has suspended mining operations pending the installation of a large new compressor plant.

At the end of November the Tretheway No. 2 shaft was down 85 feet. High grade ore is being shipped from Tretheway to Copper Cliff.

The Cobalt Concentrators, Limited, will conduct a custom sampling business at their Nipissing plant. They will sample only high-grade ore.

Winter roads are to be constructed from the T. & N. O. line to Montreal River district. Contracts have been let already for 37 miles.

The boilers for the new 18-drill compressor of the Nova Scotia mine have been installed.

At the McKinley-Darragh mine the stamp-mill is to be increased to 30 head of stamps.

Experimental shipments of Cobalt ores are being made to Great Britain and Germany. Old country smelters are becoming much interested in the camp.

The King Edward mine has discharged eighty of its men. Only forty are now employed.

The Right of Way will soon ship two cars of high-grade ore. A third quarterly dividend of seven per cent. will result from this shipment.

COPPER CLIFF.—Five cars of Cobalt ore arrived at the smelter on December 2nd. Nine more are on the road.

ALBERTA.

LUNDBRECK.—The Galbraith Coal Company of this place hoisted coal over the new plant for the first time, early in December. The plant cost $25,000. 100 tons of coal will be hoisted daily.

SASKATCHEWAN

REGINA.—The Saskatchewan Government has acquired from the Federal Government coal areas in the district of Eagle Lake. Arrangements are being carried through by which the Povincial Government will be able to mine and sell coal to settlers, before next April. The Grand Trunk Pacific Railway will pass through the district.

BRITISH COLUMBIA.

VANCOUVER.—The discovery of important seams of bituminous coal is reported 100 miles northwest of Barkerville on the projected main line of the Grand Trunk Pacific. These are the first coal lands discovered in northern Cariboo. Their economic importance is indisputable. The nearest coal lands are three hundred miles west in the Telgna district.

The re-opening of the mines and smelters of the Granby Consolidated was announced by General Manager J. P. Graves, on December 2nd. The men have agreed to accept the scale of wages in force twelve months ago. Output will be increased and plants extended immediately.

The Britannia mines on Howe Sound are closed down indefinitely. It is understood that the shut-down was caused by the owners' loss of money on the New York stock markets.

GRAND FORKS.—A large amount of coke has accumulated at the Granby smelter.

BORMDARY.—Work has started on the Crescent mine. Drifting is being done at the 300-foot level.

ROSSLAND.—The Rossland Miners' Union by referendum vote on November 26th, decided to accept the wage scale that obtained before July 1st. Instead of $4 and $3.75, machine men and shovellers will now receive $3.50 and $2.75 respectively. The resolution was carried by two thirds majority.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

Great Britain's production of tin last year was 6,698 1-2 tons, of which the Cornwall mines contributed practically the whole, namel 6,690 tons. The high price of tin in 1906, resulted in the re-opening of old mines and thus the year's output shows an increase. Notwithstanding Great Britain as a tin producing country, ranks very low compared for example, with the Federated Malay States, which last year produced nearly 55,000 tons, and of Bolivia, which exported 19,425 tons of metallic tin. Australia with 5,400 tons and China with 4,538 tons are not very far short of British production.

The Miners' Federation of Great Britain have recently decided that an attempt shall be made in all the coalfields of the United Kingdom to merge the present minimum percentage of wage into the existing standard, which would mean a material advantage to them; and the South Wales colliers have already taken steps in this direction. The owners' representatives refused, however, to discuss the question, since they claim it is entirely outside the present agreement, and in any case could not be dealt with until that agreement expires, two years hence.

According to "The Phoenix" magazine published by the Royal School of Mines, all records in shaft sinking have been broken by the Brakjan Mines Company, managed by one of the associates of the School. In the No. 1 shaft of this mine, sinking averaged 143 feet during six months, and more recently 161 feet during three months. The shaft is of the seven compartment type, and is 8 feet wide by 39 feet long.

BELGIUM.

The official returns of this country's mineral production during 1906 have just been made public. The chief industry is coal mining, the production of coal having been 23,569,860 tons, while the industry employed 139,394 persons. Belgium's metal mining interests are small, but the returns show that 3,858 tons of blende, 908 tons of pyrites, 55,950 tons of iron and small quantities of manganese and lead were won. There are, however, very considerable metallurgical undertakings in the country, including thirteen zinc smelters, besides lead and steel works, employing in all over forty thousand persons.

RUSSIA.

Since the beginning of the year the price of platium has dropped nearly one third, which according to an official report from Russia is attributable to the fact that a great quantity of old platinum has been thrown on the market.

The gold deposits in the North Ural are said to be extraordinarily rich, although they are not being worked to any great extent. This is explained by the "Ural" on the ground that the district is very inaccessible, and that capital seemingly prefers to engage in quartz mining undertakings. Several years ago the Russian Mining Department commissioned an engineer to prospect these areas, his results and reports being eminently favorable.

UNITED STATES.

The statement of the United Steel Corporation for the quarter ending September 30th, shows a gain in net earnings as compared with the crroesponding period of last year of over five million dollars, while the aggregate earnings reached the enormous sum of $43,804,285.

The report of the State Mineralogist of California places the total value of the mineral productions of that State during the last year at $46,776,085, as compared with $43,069,227 in 1905. Of this the production of metallic substances, including precious minerals, represented a value of $26,156,702; of non-metallic substances, $2,589,984; of hydrocarbons and gases, $10,170,273; and of structural materials, $7,859,126. The principal minerals of the State are first, gold, the value of which produced in 1906 was $18,732,452; second, petroleum; third, copper; fourth, clays and their products; fifth, cement; sixth, borax and seventh, silver. It is also to be noted that California produced last year a small quantity of asbestos, the value of which was $3,500.

Imports of mica into the United States last month from Canada and India principally were 572,215 pounds valued at $242,176.

At the recent meeting of the American Mining Congress at Joplin, Mo. a resolution was passed substituting that passed at last year's session, in favor of the establishment of a Federal Department of Mines. The new resolution advocates the creation of a Bureau of Mines and Engineering Investigation, under the Department of the Interior to: (1) Investigate and inquire into the nature and extent of the mine and quarry industries of the United States; (2) investigate in foreign countries concerning methods of mining, etc.; (3) investigation of, and enquiries into the engineering problems of the Government, and the testing of materials belonging to or for the use of Government; (4) to cooperate with the Geological Survey in determining the value of mineral products; (5) to publish and proptly distribute information so obtained.

The American Smelting & Refining Company has issued a circular announcing a change in methods of quoting prices on lead. The circular states the practice in the past has been to adhere to a fixed schedule for pig-lead, and to only change this schedule at rare intervals; but that henceforward prices will be fixed according to market conditions.

What is said to be the biggest and most remarkable coal mine in the world is known as Vesta No. 4, at California, Pa. During the first month of the mine's existence it produced 174,338 tons of coal, maintaining a daily output of from six to seven thousand

tons. In the mine are 600 rooms and 85 miles of stationary railway track, over which twenty-eight electric locomotives draw the coal to the surface. Steel 3-ton trams are used, one hundred going to a train. When the mine was opened two months ago, the tracks were equipped with 60-pound rails, but these proving too light, they have since been replaced with 90-pound rails. It is the intention to continue production at the rate of 175,000 tons monthly, and there is said to be sufficient coal in sight to keep the mine working for sixty years.

A coal-damp explosion at the Naomi mine, Fayette City, Pa., on December 1st, caused the death of thirty miners. The explosion was so terrific that the air-system was completely wrecked. The probable cause of the accident was the use of an open lamp in an old working. The Naomi mine is one of the largest bitimiuous mines in the district. It is owned by the United Coal Company, of Pittsburg, and gave work to 250 men.

VIRIGINIA.—Monangah mines Nos. 6 and 8 of the fairmount Coal Company, subsidary to the Consolidation Coal Company, of Baltimore, were the scenes of the horrible catastrophe of December 6th. Every effort has been put forth to rescue the 350 miners entombed by the terrible explosion of "black damp." Altogether 85 bodies have been brought to the surface. Heart-rendering scenes are witnessed daily at the pit-mouth.

COLOMBIA.

Many important discoveries of platinum are reported to have been made recently in the province of Lloro, but seemingly the Government intends to reserve the areas, as applications for mining rights have been refused. The Colombian Congress not long ago since passed a disposition constituting platinum a Government monopoly.

MEXICO.

The export metals from the Mexican Republic during the year 1906-07 was valued at $160,246,002, of which the exports of silver were $99,861,790; gold, $23,873,713 and copper, $28,018, 693.

AUSTRALIA.

Mine owners generally in Australia are complaining of the increased cost occasioned by the Federal tariff on the working of their mines, and recently a deputation waited on the Government to point out the unreasonable character of many of the new duties. They were assured, however, that a high protection would continue to be maintained on machinery which, with this assistance, Australian manufacturers were capable of producing.

The State Government of New South Wales has appointed a Commission to enquire into the question of electricity in coal mines. The board will be required to decide, whether the use of electricity in gaseous mines is attended with danger. The contention of the miners is that compressed air alone should be employed in gaseous mines, and electricity in mines where no gas has been found.

An official report upon a discovery of asbestos in the Pilbarra district, Western Australia, states that the property is situated in a very rough country, 15 miles west of Cooglegong. The asbestos occcurs in the serpentine belt running northeast and southwest, and mounded by 1 large jasper dykes. The sepentine varies in width from about 5 to 20 chains. Very little prospecting work has been done, however, and the value of the discovery is therefore quite problematical.

New iron and stel works were recently established at Lithgow, New South Wales, and production is now being made at the rate of 700 tons a day.

NEW ZEALAND.

The gold production of New Zealand last month was 26,167 ounces valued at £102,691, or considerably less than one half the yield for October, 1906.

SOUTH AFRICA.

The Government of the Transvaal has decided to operate a gold mine as a training school for miners, which remaks the correspondent of the "London Mining Journal," has met with very general approval. Considering the large number of white laborers, who are anxious to secure a training as mine workers, the step should result in advantages all round.

Costs at a number of the mines on the Rand have been considerably increased by the repatriation of Chinese miners. Thus at a recent meeting of the Glen Deep Company, the chairman, that in consequence of the necessity of replacing Chinese by native workers, the monthly profit of the Glen Deep, which during the past financial year averaged £10,000 fell to £7,423 in August and to £2,751 in September. The working costs in August had risen to 23s. 8d., and in September to 26s. 1d., as compared with an average of 21s. per ton for the year ending September, 1906.

STATISTICS AND RETURNS.

COBALT ORE STATEMENT.

For the week November 16th to 23rd:—

La Rose Mine, to Denver Col.—Nov. 18th, 66,000; Nov. 18th, 41,210; Nov. 19th., 41,335; Nov. 19th, 54,000; Nov. 19th, 66,000; Nov. 19th, 44,000; Nov. 20th, 66,000; Nov. 20th, 44,000; Nov. 20th, 66,000; Nov. 21st, 66,000; Nov. 21st, 66,000; Nov. 21st, 66,000; Nov| 22nd, 44,000; Nov. 22nd, 44,000; Nov. 23rd, 66,000; Nov. 23rd, 66,000; Nov. 23rd, 44,000; Nov. 23rd, 44,000; total, 994,545.

Temiskaming Mining Company, to American Smelting & Refining Company, Perth Amboy—Nov. 22nd, 63,000.

Totals—1,057,545.

Dominion Coal sales for November show an increase. November, 1907, 335,811 tons; November, 1906, 308,367 tons; November, 1905, 303,440 tons.

Following are the weekly shipments from Cobalt camp, and those from January 1 to-date.

	Week ending Nov. 30. Ore in lbs.	Since Jan.1. Ore in lbs.
Foster	95,500	611,806
Hudson Bay	134,000	179,170
Kerr Lake (Jacobs)	44,000	539,770
La Rose	1265,000	5,491,545
Nova Scotia	92,230	248,230
Silver Queen	120,000	957,157
Trethewey	53,750	1,648,438
Townsite	42,200	234,278
Temiskaming	63,000	355,011

The total shipments for the week were 1,912,680 pounds, or 956 tons. The total shipments since January 1, 1907, are now 25,905,-811 pounds, or 12,997 tons.

RAND GOLD OUTPUT.

Gold production of the Rand during November is estimated at 545,000 fine ounces, against 553,553 fine ounces in October, and 583,373 fine ounces in November last year. The value of the November output, calculated on the basis of the above estimate, compares as follows with preceeding months and years:—

November, 1907	$11,581,000
October, 1907	11,757,000
September, 1907	11,527,000
August, 1907	11,788,000
July, 1907	11,314,000
November, 1906	11,328,000
November, 1905	9,021,000
November, 1904	7,139,000
November, 1903	5,932,000
November, 1902	3,979,000

The output of the Dominion Coal Company's collieries in November was, roughly, 336,000 tons, as compared with 308,367 tons in November, 1906, and 342,469 in October, 1907. Comparative figures follow:—

	1907.	1906.	1905.
January	252,248	231,606	160,612
February	226,190	225,716	128,778
March	203,194	310,220	228,765
April	316,384	296,417	221,541
May	328,947	323,777	294,647
June	319,560	325,911	332,926
July	314,559	318,291	329,164
August	316,633	327,734	329,172
September	295,058	323,733	322,288
October	342,469	350,009	333,317
November	336,000	308,367	303,440
December	.....	206,884	211,877
Totals	.....	3,248,565	3,196,527

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Dec. 7 Ore in lbs.	Since Jan. 1. Ore in lbs.
Buffalo	160,000	2,298,820
City of Cobalt	.....	101,230
Coniagas	175,800	4,798,710
Cobalt Central	.....	101,360
Colonial	.....	74,250
Drummond	.....	108,920
Foster	.....	611,806
Green-Meehan	.....	196,780
Hudson Bay	.....	179,170
Imperial Cobalt	.....	37,530
Kerr Lake	.....	539,770
La Rose	171,600	5,663,145
McKinley Darragh	253,050	1,265,565
Nipissing	.....	4,468,000
Nova Scotia	.....	248,230
O'Brien	60,780	2,666,360
Red Rock	.....	91,443
Right of Way	.....	134,530
Silver Leaf	50,100	93,618
Trethewey	.....	1,648,438
Townsite	.....	234,278
Temiskaming	45,600	400,611
University	.....	61,383

The total shipments for the week were 917 pounds, or 458 tons. The total shipments since January 1, 1907, are now 26,912,831 pounds, or 13,456 tons. In 1904 the camp produced 158 tons, valued at $136,217; in 1905, 2144 tons, valued at $1,473,196; in 1906, 5129 tons, valued at $3,900,000.

The output of the Crow's Nest Pass collieries for the week ending November 29th was 21,820 tons, a daily average of 3,637 tons. For the same week last year the figures stood 13,736 and 2,289 tons.

The output of the Crow's Nest collieries for the week ending December 6 was 23,212 tons, a daily average of 3,869 tons.

British Columbia ore shipments for week ending November 30th stand as follows:—

Boundary shipments—Week, 19; year, 1,141,000.

Rossland shipments—Week, 7,038; year, 256,380.

Slocan-Kootenay shipments—Week, 3,705; year, 160,419.

The total shipments from the mines in the above districts for the past week were 10,762 tons, and for the year to date 1,557,799 tons.

Trail smelter receipts—Week, 5,373; year, 242,622.

Le Roie smelter receipts—Week, 2,862; year, 91,386.

Marysville smelter receipts—Weew, 600; year, 28,800.

The total amount of recepts reported from the olcal and foreign mines for the past week were 8,835 tons, and for the year to date 1,427,887 tons.

Shipments from the collieries of the Cumberland Railway & Coal Company, Springhill, N.S., for November were 28,741 tons. No shipments were made during August, September and October, as men were on strike.

Company Notes.

NORTH STAR MINING COMPANY, LJMITED.

The directors have to report that during the summer diamond drilling has been carried on over a small extent of the company's property, until operations were stopped by weather conditions. Some of this work was encouraging, but no new large bodies of ore were discovered.

The mining operations during the last six months have been fairly satisfactory. Additional small bodies of ore have been found in the old workings, from which ore has been shipped at the rate of about 300 tons per month. The value of this ore has averaged about $14.00 per ton, after deducting freight and treatment charges, but not mining expenses. The company's manager reports that there is at present in sight about 1,500 tons, which will enable the company to continue shipping at the same rate during the winter months.

The directors have declared a cash distribution at the rate of two cents (2 cents) per share, and notice is hereby given that the transfer books of the company will be closed at noon, on Tuesday, the 10th December, and dividend will be paid to shareholders of record on the above date on the 20th December.

The annual meeting of the stockholders of Cobalt Central Mining Company will be held on December 20th.

The Calumet & Arizona Copper Company has declared a quarterly dividend of $1.50 per share. The dividends three months ago was $5 a share.

Calumet & Hecla has declared a quarterly dividend of $10 per share. This compares with $15 per share declared in September, $20 in May, $20 in February and $20 in November, 1906.

The first annual meeting of the Coniagas Mines, Limited, was held a tthe company's office, St. Catharines, on Saturday, November 30th, with a large representative number of the shareholders present.

Mr. R. W. Leonard, president, submitted the director's report for a period of eleven months, ending October 31, 1907, showing the result of mining operations for that period. A full report will be printed and ready for distribution to the shareholders in a few days.

The following is a correct abstract taken from it:—Gross returns, $779,285.13, less total working expenses, including cost of organization, freight and treatment, etc., $154,522.91; net returns, $624,762.22; dividends paid, 1 to 3, inclusive, $240,000; bonus paid, $40,000; dividend payable November 1, 1907, $80,000; total, $360,000; balance, $264,762.22.

In addition to the above there is ore stored in dump to be concentrated of an estimated value after allowing for concentrating and treatment charges of $100,00.

Since the close of the year the president explained that a shaft to reach a lower level had been sunk to a depth of 60 feet under th 75 foot level, and that the ore at that depth was equal to any so far encountered. In reply to a vote of confidence in the management, the president stated that the one aim of the management had been to make his mine a business man's proposition, and this policy would be carried out as long as the present management continued.

The Wile Power Gas Company, of Cleveland and New York, have removed their general offices from Cutter Buildings, Rochester, N.Y., to their works, 1688-92 Columbus road, Cleveland, Ohio, where all communications should henceforth be addressed.

The company formerly known as the J. R. Alsing Company has changed its name to the J. R. Alsing Engineering Company. Its capital stock has bee nincreased from $20,00 to $100,000. No charge has been made in the personnel of the management. The main office is at 136 Liberty street, New York.

The Deister Concentration Company, for whom C. B. Fitch is Canadian agent, have shipped four No. 2 Deister table to the Coniagas Mines, Cobalt, Ont.

The statement of the McKinley-Darragh Mine, issued on November 21st, shows total cash on hand to be $53,536. To this amount must be added approximately $120,000 due on ore shipped to the smelters. The following figures represent receipts and expenditures from the organization of the company until November 1st, 1907.

Receipts from sale of treasury stock	$162,304.92
Receipts from sale of ore	127,081.18
	$289,386.13
Disbursements—	
Savage mine—	
Debts	$ 6,244.88
Plant	14,550.90
Development and operations	18,399.90
McKinley-Darragh—	
Plant	36,667.25
Development and operating	90,135.86
General	24,404.73
Interest and discount	1,503.22
Office furniture	242.44
Dividend	44,150.96

The balance left on hand is $53,536.47.

Since July 10th, when a car load of ore netting $21,147.37 was sold, ten car loads, or 562,000 pounds, of ore have been shipped. Forty-nine thousand four hundred and eighty-three dollars and seventy-seven cents has been received in cash, and $125 remains due the mine for ore sold. On November 1st there were on hand at the mine of No. 1 ore 51,770 pounds; silver nuggets from the lake shore, 4,495 pounds; concentrates, 24,896 pounds; No. 2 ore, 141,485 pounds. The value of the above ore is estimated at $52,-000. Since July 7th, then, 934,400 pounds of ore have been produced, worth, roughly, $200,000.

The completion of the coffer dam across the south end of Cobalt Lake and the pumping out of the water rendered available not only nuggets but some second grade and milling ores. Altogether 4,500 pounds of nuggets; 100 tons of 300 ounce ore; and 1,500 tons of milling ore, 150 ounces to the ton, were won by the dam.

METAL, ORE AND MINERAL MARKET.

Aluminum, No. 1 grade ingots—37 to 40 cents per lb.
Antimony—7 3-4 to 10 cents per lb.
Arsenic, white—6 1-4 to 6 3-4 cents per lb.
Barytes, crude—$18 to $20 per short ton.
Bismuth, metal—$1.75 per lb.
Cadmium, metal—$1.50 per lb.
Carbons for drills—$70 to $90 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—30 to 40 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$10 per short ton.
Flourspar, lump—$8 to $13 per long ton.
Graphite, domestic—$50 to $150 per ton.
Gypsum, lump—$7 per short ton.
Infusorial earth, ground—$15 to $30 per ton.
Manganese, pure metal—75 cents per lb.
Mica, ground—$40 to $70 per short ton.
Mica, scrap—$10 to $15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 90 per cent. pure—$4.50 to $5 per unit.
Nickel, metal—45 cents per lb.
Platinum, ordinary metal$26 per ounce.
Platinum, scrap—$18 per ounce.
Pyrite—10 to 11 3-4 cents per unit for 38 to 45 per cent. sulphur, lump ore or fines.
Quicksilver—$45 per 75 lb. flask.
Sulphur—$10 to $21 per long ton.
Talc—$15 to $40 per short ton, crude.
Tungsten, pure metal—$1.20 per lb.
Tungsten ore, 60 per cent. pure—$9.50 per unit.

MARKET NOTES.

Silver, Nov. 21st, 58 1-2; Nov. 22nd, 58 3-8; Nov. 23rd, 58 3-4; Nov. 25th, 58 3-8; Nov. 26th, 57 7-8; Nov. 27th, 57 3-8; Nov. 29th, 57 3-4; Nov. 30th, 57 5-8; Dec. 2nd, 57 3-4; Dec. 3rd, 57 3-4; Dec. 4th, 57 7-8.

Dec. 4th, Mexican dollars, 46 1-2 cents; sterling exchange, $4.86.

Copper.—Both New York and London markets are weak, with a small volume of business reported. New York, lake 13 1-2; electrolytic, 13 1-4 on Dec. 4th; London, £60.

Spelter.—The market in spelter has gone to pieces. New York, 4.45 cents; London, £21.

Lead.—Market still weakening. Very little business. New York, 4.05 cents; London, £15 15s. for Spanish.

Tin.—Market weak. New York, 30 1-4 cents; London, £144 10s. for spot.

Pig Iron.—Pittsburg, Bessemer, $18 to $20. No. 2 foundry, $18.50.

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OF

A.I.M.E. TOUR

THROUGH

COBALT, SUDBURY AND MOOSE MOUNTAIN

OWING to the extreme care necessary in handling the colour press work in printing this volume the publishers have been unable to bring it out as soon as was hoped. It is now ready.

Orders have been received for a large number. It is probable that a second edition will have to be printed. The publishers will consider it a favor if intending purchasers will send in their orders as promptly as possible. In this way the need of a second edition can be determined early.



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The very best advice that the publishers of the anadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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DeMorest, Stull & Low
Evans & Laidlaw
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Gwillim, J. C.
Gillespie, G. H.
Handley & McNaughton
Haultain, H. E. T.
Haight, D. H.
Hassan, A. A.
Hille, F.
Laird & Routley
Lindeman, Einar
Loring, F. C.
Mattair, L. H.
Roland, W.
Scott, O. N.
Tyrrell, J. B.
Willmott, A. B.
Willis, Alfred B.

Nova Scotia

Jennison & Dahl

Quebec

Cirkle, Fritz
Hardman, J. E.
Hersey, Milton L.
LeRoy, O. E.
Robinson, A. W.

British Columbia

Haggen, Edward A.
Baker, C. S.
Fowler, S. S.
Jorgensen, C. E.
Rebbeck, James K.
Bryant, C. M., & Co.
Langley & Musgrave.

FOREIGN—New York

Hassan, A. A.

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Evans & Laidlaw
Heys, Thos. & Son
John, D.
Lamble, B. C.
Russell, J. W.
Urquhart, W. J.

Quebec

Hersey, Milton L.

Nova Scotia

McCallum, A. L.

British Columbia

Baker, C. S.
Widdowson, E. W.

Foreign

New York

Ledoux & Co.

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Graham, Harvey D.
Hartman & Smiley
Langworthy & McComber
McGaughey & McCurrey
McDougall & McNairn-Hall
Ryckman, Kerr, MacInnes & Mahon

Quebec

Greenshields, Greenshields & Languedoc
Fleet and Falconer

Nova Scotia

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The output of iron, copper, nickel, silver and cobalt in 1906 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province, salt, petroleum and natural gas are important products. The cement and clay industries have a large output.

The mining laws of Ontario are liberal, and the prices of mineral lands low.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe.

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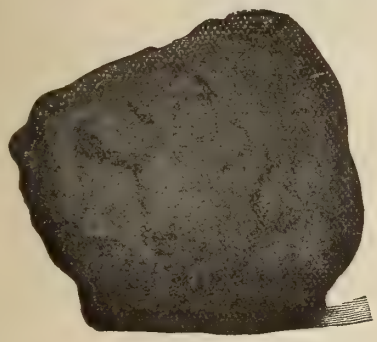
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All mines belong to the Government of the Province on all unsold lands and on all those sold since the 24th July, 1880, but gold and silver are always reserved whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The Government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such license the first right to purchase the mines. In the case of lands where the surface only is sold, the owner of the surface may be expropriated if he refuses an amicable settlement

The price of prospecting licenses is $5.00 per hundred acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the Government. The purchase price is as follows:—

On lands situate more than 20 miles from a railway in operation, $10.00 per acre, and on lands situate less than 20 miles from such a railway, $20.00 per acre:

Superficial products and building materials are sold $2 and $4 an acre according to the distance from rail road.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions: The full price must be paid in cash; specimens must be produced and accompanied by an affidavit; a survey at the cost of the applicant must be made on unsurveyed lands; work must be bona fide begun within two years and $500.00 spent for each 100 acre concession.

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The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the Government

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made, and through which the new Transcontinental Railway will run.

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The Bureau of Mines, at Quebec, will give all the information asked for in connection with the mines of the province, and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to:

The Hon. Minister of Colonization, Mines and Fisheries,
Parliament Buildings, Quebec.

The Canadian Miner's Buying Directory.

SEE INDEX TO ADVERTISERS PAGE XXVIII.

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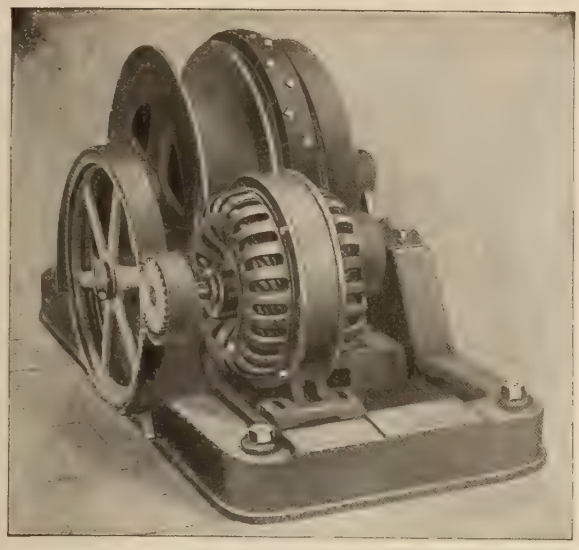
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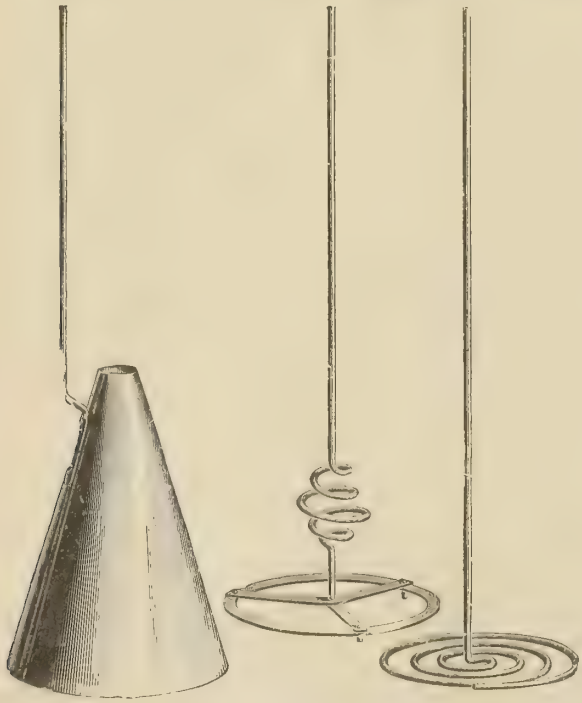
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